

THE

FAR EASTERN REVIEW

FINANCE ENGINEERING COMMERCE



TARIFF AUTONOMY FOR CHINA

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HISTORY OF BAMBOO STEEL

上海仁記路拾六號

遠東時報

Vol. XXI

September, 1925

No. 9

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Reconstruction Number

of

The Far Eastern Review



PRESS REVIEWS

North-China Daily News :

An Echo of the Earthquake

The Reconstruction Number of the "Far Eastern Review," which has just come off the press, is one of the most remarkable publications ever issued in the Far East. Consisting of more than 400 large quarto pages, the magazine gives a fully illustrated and graphic account of the efforts of the Japanese Government and Japanese engineers to reconstruct Tokyo and Yokohama. Excellent reproductions of photographs depict the enormous damage done by the earthquake over a wide area and also the feats of reconstruction the Japanese have accomplished since. To Chinese, this publication ought to be of the utmost interest at this time, when so much of the wealth of the country is being wasted in destructive efforts, while Japan is constantly forging ahead because of the constructive genius of the Japanese people. Although primarily of interest to engineers many others will feel that \$5.00, at which price this special issue is sold, will be well invested in acquiring a copy. It is printed by *The North China Daily News* and is on sale at all booksellers.

Shipping and Engineering :

Mr. George Bronson Rea, Editor and Publisher of the *Far Eastern Review*, Shanghai, is heartily to be complimented on the Japanese Reconstruction Number of the Journal, which has just made its appearance, and which is probably the most valuable, interesting and praiseworthy issue of any periodical that has yet been printed in the Far East. Dedicated to the Japanese engineer, "whose monument will ever be the recreation of Tokyo and Yokohama after the terrible earthquake and fires had reduced those cities to veritable dust," this noteworthy issue of a monthly magazine which already stood in a class alone and apart, constitutes a printed and pictorial record of one of the mightiest industrial and engineering efforts in history—the reconstruction of Japan's capital and her largest port after one of the worst calamities in the records of mankind; and one cannot pay the *Far Eastern Review* a greater compliment than by saying that the Reconstruction Number is a worthy record and appreciation of the mighty effort its pages depict so well. As an example of the printer's art, too, it stands as a glowing testimony to the *North-China Daily News & Herald, Ltd.*, which, with all its long record, has done nothing better than this, and has produced a magazine of more than 400 pages in a manner which could not be improved on by any printing concern in the world.

Hongkong Telegraph :

Japan's Reconstruction

It is now just two years since the greatest calamity that Japan had ever known in her history affected a large area of her most populous territory—destroying one of her large seaports and wrecking a great deal of her capital. There was terrible loss of life, and scenes of horror such as only a vast catastrophe can give rise to. There was not a single country of the world that did not deeply sympathise with the Land of the Rising Sun in its disastrous grief, and help came pouring in from all sides. It was realised that the country's sorrows were such as to render its programmes of development nugatory to a large extent, and it was perhaps wondered in some quarters whether the land was not actually crippled for some time to come. However, with characteristic energy, the Japanese people and Government immediately proceeded to remedy the effects of the stroke of fate that had been dealt them, and within a few months everything went on almost as usual. The terrible effects of the great earthquake are still evident at both Yokohama and Tokyo, but a great amount of reconstruction work has been accomplished. In the comparatively short space of two years the Japanese engineers and their assistants have rebuilt much that had been destroyed, and it should not be long before practically all the broken achievements of the past are replaced. We are reminded of this achievement by the recent publication of a journal devoted to a description, graphically illustrated, of the feat that the reconstruction department has performed—and it is undoubtedly an accomplishment of which the Japanese nation can be justly proud; and which should form an example to certain other races which put words before deeds, and get no further along the road of progress.

The Far Eastern Review

ENGINEERING

FINANCE

COMMERCE

VOL. XXI

SHANGHAI, SEPTEMBER, 1925

No. 9

Tariff Autonomy for China

An Analysis of the History of the Tariff in China—The Movement for Autonomy—The Attack on British Predominance in the Customs Service

THE tariff problem in China differs from similar problems in other countries in that China has not the right to increase her tariff without the consent of a large number of other Governments, some of them Great Powers, others, small and unimportant European or South American States. China lost this right in the first war with a European Power, the so-called Opium War, which ended in the signing of the treaty of Nanking in 1842. Although the Chinese contend that that war was fought over the question of opium, not a word is said with regard to the drug in the Treaty, but trade and the rights of foreigners to trade in China is discussed at great length. From the standpoint of the British, this was not a war to force China to purchase opium, but to force China to recognize the equality of nations, the right of one people to hold intercourse and to have commerce with another. This right had become well-established in Europe. It was still unknown in Asia. Although the economic ideas of the time, suggest a wide *laissez faire* policy; yet it was nowhere contended that a country could not take steps to regulate the import of goods and the outflow of gold and silver, although the free traders in England, under the influence of Adam Smith's objections to mercantilism believed that any impediments to trade were disastrous.

Such were the ideas of the first Britons who came to trade with China and who not only found that there were numerous impediments to trade, that mercantilism was the dominant economic doctrine, but that the administration of the government of the country was such that any official could place such exactions upon trade as to make it precarious. They found that the Viceroy of the Liang Kwang and the Hoppo of Canton preferred smuggling to the establishment of a regularized system because they personally profited more from the smuggling. They found that instead of being permitted to land in peace, to visit the country freely, to study the market, to have intercourse with the people. Instead, they were couped up in a small island. They were forced to deal through an association of merchants, the co-hong, which hampered trade, gave the foreigners misinformation and working together with the officials, caused exactions to be levied on goods, which made trading in the usual commodities of commerce, cotton and woollen goods, outside the scope of the standard of living of the people. Opium was the profitable commodity of commerce. But the trade in opium was illegal and caused economic distress because so much of the silver of the country was exported to pay for this ruinous articles of commerce.

The opium trade proved particularly offensive to the Emperor of China, Taokwang, and to Commissioner Lin, who had been appointed by the Government to suppress the opium trade. Commissioner Lin was a man of integrity and ability. To him, opium represented not only bad national economics but bad morals. Opium was vice. But the foreigners could not deal with Commissioner Lin directly. They could only reach him through the Co-hong. To misunderstanding was added misunderstanding. To irritation was added irritation until war resulted. In the war, China was defeated.

The subsequent treaty lost for China, tariff autonomy. In treaties which were later made with other nations the "most favored nation clause" was inserted, so that all Treaty Powers enjoyed the right of participation in the regulation of China's tariff. This condition exists to this day.

The amount levied on good in China in accordance with the various treaties and agreement was a 5 per cent. *ad valorem* duty. Often, the actual market value of goods made it necessary to hold conferences to bring the duty up to an effective 5 per cent. During recent years, the Treaty Powers have agreed to a famine relief fund surtax. Duties of 5 per cent. are levied on exports as well as imports and there is a tax on goods exports, as between ports.

In 1902, a treaty was arranged between Great Britain and China, known as the MacKay Treaty, by which it was hoped that China might obtain a more equitable arrangement with regard to her tariff rights. Goods in China, in transit, are taxed either under a system known as Likin or through the Chinese Maritime Customs on a transit pass. Morse describes Likin as follows:

Likin

"The exigencies of the Government during the Taiping rebellion drove the authorities to devise new forms of taxation, and Likin ("contribution of a thousandth") was instituted. It was first heard of in 1853; and about 1861 when the active suppression of the rebellion called for largely increased expenditure, it was applied generally to all the Provinces then under the control of the Imperial authorities. The original theory of the levy, one-tenth of one per cent. on the value, imposed no great burden on trade, a tax of the same amount levied as wharfage dues for the maintenance of the foreign municipalities at Shanghai, Tientsin, Hankow and elsewhere, being scarcely felt; but practice soon parted company with the theory, and the official rates were much increased. Nor is the tax uniform in its incidence in all the Province. Hunan is proud of its independence and freedom from non-customary exactions, and in this Province the payment once of the full tariff rate of likin exempts goods from further payment within the provincial limits, while the accretions and irregular exactions are less than elsewhere in China; Hunan is, however, exceptional. Kwangtung is more nearly typical of the Empire; here between Canton and Wuchow, a distance of about two hundred miles on the West River, there are six Likin "barriers," each constituting a barrier to the free movement of traffic, and each involving delay, vexation, and payment. Along the Grand Canal between Hangchow and Chinkiang, likin stations, alternately collecting and preventive, are established at distances averaging ten miles one from the other and in that part of Kiangsu lying south of the Yangtze there are over 250 stations, collecting or preventive. To get at the amount paid by the people is more difficult in the case of likin than of other taxes. The land tax and the grain tribute are assessed according to registers very strictly kept, and both are under the control of the Hsien (District Magistrate), the 'Father and Mother of the People,' and yet as we have seen, the regular legal accretion is, at the very lowest estimate, from 100 per cent. up to almost anything in reason. Likin is a new levy with its own administration independent of all other taxing agencies, and the collection is much more in the hands of the officer in charge of each barrier and his subordinates than is possible with other taxes."

To avoid the payment of Likin, the "Transit Pass" was devised. By the Treaty of Tientsin (1858) it was agreed that a fixed sum might be paid at the port of entry or at the first likin station in addition to the regular customs dues. The certificate issued upon such payment exempted the goods from further payment of likin. This rule was applied to goods for export or import. The amount agreed upon is $2\frac{1}{2}$ per cent. *ad valorem* in addition to the 5 per cent. collected by the Chinese Maritime Customs. The Transit pass has not always proved satisfactory. Mr. Gerald King in an article in the FAR EASTERN REVIEW discusses this subject:

"The transit pass is, of course, a great deal better than nothing. The main difficulties are, that in order to see that the goods being conveyed are those covered by the pass the authorities at the various barriers must have the right of examination. This is just, as, did they not the dishonest merchant would be able to profit by it. But the power of examination gives them the chance of making additional squeezes, for they can always demand a *pour boire* for not examining: threatening to examine if it is refused, and so causing a delay of three or four days at each of the barriers to be passed. These difficulties will only cease with the total abolition of the barriers. . . . If the merchant elects to move his goods without a Transit Pass, he must make his own arrangements with the authorities. This is usually done by large Chinese firms on the basis of a fixed monthly payment, or fixed sum for each movement of goods. The Government is doubly defrauded by this system, since the merchant pays on less goods than he moves, and the official reports less duty than the merchant paid. . . .

"It sometimes happens that Likin officials will compete with the Transit Pass system, by offering a rate which is just cheaper than the cost of the pass, and of course arranging to the merchant's satisfaction that there will be no delays, disputes or attempts to avoid the bargain. This can only be done where the goods have not far to go, or they would pass other barriers than those under the control of the man with whom the original bargain was made."

The Sino-Japanese Treaty of 1896 which states this subject more clearly perhaps than any other treaty, reads:

Article X.—All articles duly imported into China by Japanese subjects or from Japan shall, while being transported, subject to the existing regulations, from one open port to another, be wholly exempt from all taxes, imposts, duties, likin, charges and exactions of every nature and kind whatsoever irrespective of the nationality of the owner or possessor of the articles, or the nationality of the conveyance or vessel in which transportation is made.

Article XI.—It shall be at the option of any Japanese subject desiring to convey duly imported articles to an inland market to clear his goods of all transit duties by payment of a commutation transit tax or duty, equal to one-half of the import duty in respect of dutiable articles, and two and one-half per cent. upon the value in respect of duty free articles; and on payment thereof a certificate shall be issued, which shall exempt the goods from all further inland charges whatsoever. It is understood that this Article does not apply to imported opium.

Article XII.—All Chinese goods and produce purchased by Japanese subjects in China, elsewhere than at an Open Port thereof and intended for export abroad, shall in every port of China be freed from all taxes, imposts, duties, likin, charges and exactions of every nature and kind whatsoever, saving only export duties when exported, upon the payment of a commutation transit tax or duty calculated at the rate mentioned in the last preceding Article, substituting export duty for import duty, provided such goods and produce are actually exported to a foreign country within the period of twelve months from the date of the payment of the transit tax; all Chinese goods and produce purchased by Japanese subjects at the ports of China and of which export to foreign countries is not prohibited, shall be exempt from all internal taxes, imposts, duties, likin, charges, and exactions of every nature and kind whatsoever, saving only export duties upon exportations; and all articles purchased by Japanese subjects in any part of China, may also, for the purpose of export abroad, be transported from open port to open port, subject to the existing Rules and Regulations.

The MacKay Treaty sought to obviate the difficulties arising from this double system of taxation. The preamble to Article VIII of this treaty reads:

Article VIII.—Preamble.—The Chinese Government, recognizing that the system of levying *likin* and other dues on goods at the place of production, in transit, and at destination, impedes the free circulation of commodities and injures the interests of trade, hereby undertake to discard completely those means of raising revenue with the limitations mentioned in section 8.

The British Government, in return, consent to allow a surtax, in excess of the Tariff rates for the time being in force to be imposed on foreign goods imported by British subjects and a surtax in addition to the export duty on Chinese produce destined for export abroad or coastwise.

It is clearly understood that, after *likin* barriers and other stations for taxing goods in transit have been removed, no attempt shall be made to revive them in any form or under any pretext whatsoever; that in no case shall the surtax on foreign imports exceed the equivalent of one and a half times the import duty leviable in terms of the Final Protocol signed by China and the Powers on the 7th day of September, 1901; that payment of the import duty and surtax shall secure for foreign imports, whether in the hands of Chinese or non-Chinese subjects, in original packages or otherwise, complete immunity from all other taxation, examination or delay; that the total amount of taxation leviable on native produce for export abroad shall under no circumstances, exceed $7\frac{1}{2}$ per cent. *ad valorem*.

Under the terms of this treaty, had China abolished *likin*, there would have been an appreciable increase in the customs revenue and the way would have been paved for tariff autonomy. The Chinese Government has, however, not been able to abolish *likin*, which under the Republic, has become the principal source of revenue for the Provinces. If the amount collected ranges between \$40,000,000 and \$60,000,000, the national government must provide the provincial authorities with an adequate substitute. Although, it is true that most of this *likin* money is withheld from the Government by the local officials, it is also true that the latter use these funds for military and political expenditures and that they will never consent to give up this source of revenue unless some other is placed at their disposal. The result has been that the MacKay Treaty has always been very unpopular with the officials of China and its terms have never been operative.

At the Washington Conference, the tariff question again arose. Dr. Wellington Koo presented a statement of China's case, in which he repeated the tariff history of China in which in its more important implications has here been given. The report of the statement ends with the following:

Chinese Viewpoint

In view of the foregoing reasons, Dr. Koo asked the Powers to agree to the restoration to China of her tariff autonomy. In making this request, the Chinese Government entertained no desire to interfere with the present administration of the maritime customs, which was generally considered to be efficient and satisfactory, nor to interfere with the devotion of the funds of the maritime customs to the liquidation of foreign loans secured thereon. What he had uppermost in mind in asking for the recognition of China's tariff autonomy was the right to fix and differentiate the tariff rates. As the establishment of such a new *regime* would require time, it should come into force only after a period to be agreed upon. Before that period, a maximum rate should be agreed to, and within that maximum rate China should enjoy full freedom of differentiating rates, for example between luxuries and necessities. But negotiation for the purpose of fixing a maximum rate might take months, and as the present Chinese financial condition needed some immediate relief, it was proposed that on and from January 1, 1922, the Chinese import tariff should be raised to $12\frac{1}{2}$ per cent., a rate mentioned in the Chinese treaties with Great Britain, the United States and Japan.

In the discussion which followed Dr. Koo's statement, attention was constantly called to the question of *likin*. Elihu Root raised this question to which Wellington Koo dexterously replied that most of the people of China wanted *Likin* abolished, but such a reply is really meaningless in face of the strong opposition to the abolition or limitation of trade impeding taxation by the militarists of the country.

The specific proposal for an agreement which the Chinese government submitted to the Washington Conference with a view toward the gradual obtaining of tariff autonomy ought here to be given in full:

1. The present import duty of 5 per cent. shall be forthwith increased to $12\frac{1}{2}$ per cent.

2. China agrees to abolish likin on January 1, 1924, and the Powers agree to put in force on the same day the levy of certain surtaxes on import and export duties provided for in the Treaty of 1902 with Great Britain and in that of 1903 with the United States and that of 1903 with Japan; and the Powers further agree to the levy of an additional surtax to be put in force on the same day for articles of luxury over and above the import tariff rate of $12\frac{1}{2}$ effective. In all other respects, the undertakings of China and the Powers herein stipulated are to be carried out in accordance with the terms of the Treaties above mentioned.

3. Within five years from the date of agreement, a new customs régime shall be negotiated and concluded by treaty on the basis of a maximum rate of 25 per cent. *ad valorem* for any article imported into China, within which rate China is to be free to regulate and arrange the import tariff schedule. This new régime is to be in force until the end of the period referred to in paragraph 5 below.

4. The reductions now applicable to the customs duty collected on goods imported into and exported from China by land shall be abolished.

5. The treaty provisions between China and the Powers by which the levy of customs duties, transit dues and other imposts is regulated shall be abrogated at the end of 10 years from date of agreement.

6. China voluntarily declares that she is not contemplating to effect any fundamental changes in the present system of customs administration, or to disturb the devotion of the customs revenue to the services of the foreign loans secured thereon.

It will be noticed that under clauses 3, 5 and 6 of this proposal, China's tariff autonomy is still limited for a further period of ten years from the date of signing the agreement. Furthermore, no suggestion of a change in administration, that is, the elimination of the British, Inspector-General and the large number of foreigners in the employ of the customs is suggested. This was China's maximum demand at the time of the Washington Conference.

The increased tariff, as proposed by China, would have hurt Japan's economic position, more than any other nation. For, Japan's principal export market is China, a position which is justified by the propinquity, if for no other reason, of the two nations. Furthermore, much that Japan exports to China, goes directly to the people and goes into the interior. In such places, the question of illegal taxes often arises. Mr. Odagiri, a director of the Yokohama Specie Bank, who is an outstanding authority on conditions in China, presented Japan's statement, which read:

Taking into consideration the views and suggestions made by our colleagues at yesterday's meeting, as well as of the commercial relations between Japan and China, the Japanese sub-committee states its views regarding the increase of tariff as follows:

As the Japanese trade with China covers more than 30 per cent. of China's foreign trade, the country which would suffer most by the revised tariff would be Japan.

Japan supplies those articles which are mostly sold to the lower class of people in China to satisfy their daily need. Those goods imported from Japan represent the production of a large number of comparatively small Japanese manufacturers.

Therefore, this sudden and big increase of tariff would mean on the one hand forcing high prices, to the purchasers in China—the majority of the common people—causing a higher cost of living, and, on the other hand, would mean a serious effect upon the industry of Japan. In consequence it is very important that the tariff revision should follow a gradual process, allowing enough time to enable the people of the countries concerned to adjust their economic life accordingly.

In the foregoing circumstances the Japanese sub-committee declares, much to its regret, that in its opinion the abrupt increase of tariff to an effective $7\frac{1}{2}$ rate—more than doubling duties of the present $3\frac{1}{2}$ per cent. tariff—is impossible to put into practice, and as to a $12\frac{1}{2}$ per cent. tariff, it is absolutely impractical.

The revision which the Japanese sub-committee believes proper is an increase of the present tariff to an effective 5 per cent. in

accordance with the agreement between the Chinese Government and the diplomatic bodies in Peking.

But in order to avoid the delay of 6 months to one year required for the establishment of the aforesaid conversion, the Japanese sub-committee would propose the alternative measure which will avoid unnecessary delay and will result in greater advantage to the Chinese Government.

As an alternative measure, it is proposed to levy a surtax, of say 30 per cent., upon export, import and coastwise trade, which should bring in to the Chinese Government an additional revenue of approximately silver \$20,000,000.

The fruit of raising the tariff to an effective 5 per cent., on imports would be an increase of revenue of about silver \$16,000,000.

This suggested surtax is not an entirely new idea, for this year all the Powers agreed to the imposition of a surtax of 10 per cent., levied on all customs dues for one year, as a measure of temporary famine relief, and it was estimated by the customs authorities that this surtax would produce about taels 5,000,000.

Of course, the Japanese sub-committee would not mean absolutely and permanently to refuse its assent to the proposal to increase the tariff. On the contrary it would say that Japan is ready to assist the Chinese in revising the tariff as is shown in the supplementary Treaty of Commerce and Navigation which was concluded during the year 1903.

There is no objection whatever on the part of Japan to the suggestion to appoint an international committee to proceed to China and study the condition of tariff, the likin, and related matters, in order to solve this difficult question and present to the respective Governments any workable scheme for increasing the tariff.

The Treaty

The Treaty which was finally concluded reads as follows:

The United States of America, Belgium, the British Empire, China, France, Italy, Japan, The Netherlands and Portugal:

With a view to increasing the revenues of the Chinese Government, have resolved to conclude a Treaty relating to the revision of the Chinese customs tariff and cognate matters, and to that end have appointed as their Plenipotentiaries, (*Names identical with those in previous Treaty*) who, having communicated to each other their full powers, found to be in good and due form, have agreed as follows:

Article 1. The representatives of the Contracting Powers having adopted, on the fourth day of February, 1922, in the City of Washington, a Resolution, which is appended as an Annex to this Article, with respect to the revision of Chinese Customs duties, for the purpose of making such duties equivalent to an effective 5 per centum *ad valorem*, in accordance with existing treaties concluded by China with other nations, the Contracting Powers hereby confirm the said Resolution and undertake to accept the tariff rates fixed as a result of such revision. The said tariff rates shall become effective as soon as possible but not earlier than two months after publication thereof.

Annex

With a view to providing additional revenue to meet the needs of the Chinese Government, the Powers represented at this Conference namely the United States of America, Belgium, the British Empire, China, France, Italy, Japan, The Netherlands and Portugal agree:

That the customs schedule of duties on imports into China adopted by the Tariff Revision Commission at Shanghai on December 19, 1918, shall forthwith be revised so that the rates of duty shall be equivalent to 5 per cent., effective, as provided for in the several commercial treaties to which China is a party.

A Revision Commission shall meet at Shanghai, at the earliest practicable date, to effect this revision forthwith and on the general lines of the last revision.

This Commission shall be composed of representatives of the Powers above named and of representatives of any additional Powers having Governments at present recognised by the Powers represented at this Conference and who have treaties with China providing for a tariff on imports and exports not to

exceed 5 per cent. *ad valorem* and who desire to participate therein.

The revision shall proceed as rapidly as possible with a view to its completion within four months from the date of the adoption of this Resolution by the Conference on the Limitation of Armament and Pacific and Far Eastern Questions.

The revised tariff shall become effective as soon as possible but not earlier than two months after its publication by the Revision Commission.

The Government of the United States, as convener of the present conference, is requested forthwith to communicate the terms of this Resolution to the Governments of Powers not represented at this Conference but who participated in the Revision of 1918, aforesaid.

Article II. Immediate steps shall be taken, through a special Conference, to prepare the way for the speedy abolition of *likin* and for the fulfillment of the other conditions laid down in Article VIII of the Treaty of September 5, 1920, between Great Britain and China, in Articles IV and V of the Treaty of October 8, 1903, between the United States and China, and in Article I of the Supplementary Treaty of October 8, 1903 between Japan and China with a view of levying the surtax provided for in those articles.

The Special Conference shall be composed representatives of the Signatory Powers, and of such other Powers as may desire to participate and may adhere to the present Treaty, in accordance with the provisions of Article VIII, in sufficient time to allow their representatives to take part. It shall meet in China within three months after the coming into force of the present Treaty, on a day and at a place to be designated by the Chinese Government.

Article III. The Special Conference provided for in Article II shall consider the interim provision to be applied prior to the abolition of *likin* and the fulfillment of the other conditions laid down in the articles of the treaties mentioned in Article II; and it shall authorize the levying of a surtax on dutiable imports as from such date, for such purposes, and subject to such conditions as it may determine.

The surtax shall be at a uniform rate of 2½ per centum *ad valorem*, provided, that in case of certain articles of luxury which, in the opinion of the Special Conference, can bear a greater increase without unduly impeding trade, the total surtax may be increased but may not exceed 5 per centum *ad valorem*.

Following the immediate revision of the customs schedule of duties on imports into China, mentioned in Article I, there shall be a further revision thereof to take effect at the expiration of four years following the completion of the aforesaid immediate revision, in order to ensure that the customs duties shall correspond to the *ad valorem* rates fixed by the Special Conference provided for in Article II.

Following this further revision there shall be, for the same purpose, periodical revisions of the customs schedule of duties on imports into China every seven years, in lieu of the decennial revision authorized by existing treaties with China.

In order to prevent delay, any revision made in pursuance of this Article shall be effected in accordance with rules to be prescribed by the Special Conference provided for in Article II.

Article V. In all matters relating to customs duties there shall be effective equality of treatment and opportunity for all the Contracting Powers.

Article VI. The principle of uniformity in the rates of customs duties levied at all the land and maritime frontiers of China is hereby recognized. The Special Conference provided for in Article II shall make arrangements to give practical effect to this principle and it is authorized to make equitable adjustments in those cases in which a customs privilege to be abolished was granted in return for some local economic advantage.

In the meantime, any increase in the rates of customs duties resulting from tariff revision, or any surtax hereafter imposed in pursuance of the present Treaty shall be levied at a uniform rate *ad valorem* at all land and maritime frontiers of China.

Article VII. The charge for transit passes shall be at the rate of 2½ per centum *ad valorem* until the arrangements provided for by Article II come into force.

Article VIII. Powers not signatory to the present Treaty whose Governments are at present recognized by the Signatory Powers, and whose present treaties with China provide for a tariff on imports and exports not to exceed 5 per centum *ad valorem*, shall be invited to adhere to the present Treaty.

The Government of the United States undertakes to make the necessary communications for this purpose and to inform the governments of the Contracting Powers of the replies received. Adherence by any Power shall become effective on receipt of notice thereof by the Government of the United States.

Article IX. The provision of the present Treaty shall override all stipulations of treaties between China and the respective Contracting Powers which are inconsistent therewith, other than stipulation according to most favoured nation treatment.

Article X. The present Treaty shall be ratified by the Contracting Powers in accordance with their respective constitutional methods and shall take effect on the date of the deposit of all the ratifications, which shall take place at Washington as soon as possible. The Government of the United States will transmit to the other Contracting Powers a certified copy of the proces-verbal of the deposit of ratifications.

The present Treaty, of which the English and French texts are both authentic, shall remain deposited in the archives of the Government of the United States, and duly certified copies thereof shall be transmitted by that Government to the other Contracting Powers.

In faith whereof the above-named Plenipotentiaries have signed the present Treaty.

Done at the City of Washington the sixth day of February, One Thousand Nine Hundred and Twenty-two.

This treaty was not ratified by France, owing to a difference between China and France, known as the Gold Franc Issue. Which ever side was right in that particular case does not concern us in this article. *France's failure to ratify, however, had very important bearings upon subsequent events in China. For the masses of the Chinese people did not understand the importance of ratification. They simply understood that the Powers had met at Washington, had come to an understanding with regard to China's tariff and that nothing further happened. They reached the conclusion that the Powers were insincere and that the Washington Conference was a bluff. They lost faith in the Washington Conference. This impression was prevalent throughout China and is one of the explanations of the extensive levying of illegal taxation by the provincial authorities.*

Illegal Taxation

The provincial governments have been collecting form of *likin* and various transit and consumption taxes on foreign goods in contravention of the treaties. Their major argument has been that the foreign Powers had made certain promises at Washington which they had failed to keep and that therefore the provincial authorities were justified in taking whatever steps they found suitable to raise additional revenues. This specious argument has led to serious difficulties, as the principal foreign Powers, Great Britain, Japan and the United States were at all times prepared to hold the tariff conference and to make the necessary revisions.

During the student and laborer's movement arising out of the events of May 30 an agitation arose for tariff autonomy although this demand arose simultaneously with the cry for the abolition of all special privileges enjoyed by foreigners, it was aimed specifically at Great Britain, because the Inspector General of Customs is a Britisher and a large number of the foreign staff are Britishers. The demand for tariff autonomy, at the moment, was not so much pronationalistic as it was anti-British, just as the shipping strike differs from other labor movements in that it is a specific and specialized attack on British interests in China. We need not, for the purposes of this article, analyse the reasons behind this attack on Britain; it is sufficient to record the fact.

The Gold Franc Case having been settled, France was prepared to ratify the treaties and the United States as convener of the Washington Conference, proposed the holding of the tariff conference in Peking on October 26. This date has been agreed upon and at the moment, the delegates are on their way to Peking.

The views of the various governments with regard to the revision of the tariff are quite clear. Secretary of State Frank B. Kellogg, in a speech before the American Bar Association at Detroit said:

"I believe that the Powers, in concluding the tariff conference, must broaden the scope of their work beyond treaty," he declared.

"America is willing either at this conference or subsequently to consider with China a comprehensive revision of the treaties dealing with the entire subject of the tariff. The tariff schedules were not adopted as a sinister means of controlling the fiscal policies of the Chinese Government, but as a means of remedying the situation, which has become a fertile source of friction between China and the Powers."

Mr. Austin Chamberlain, in his address before the China Association said:

"We are ready to carry out in letter and in spirit the Washington engagement, but for the full fruition of the conference to which our guests are going and of the inquiry into extraterritorial rights two preliminary conditions are desirable. I am not sure, that for the full attainment of our object I ought not to say that they are necessary."

Japanese Viewpoint

The Japanese Government sent a note to China, the gist of which is contained in the following summary:

"The Japanese Government are now prepared to consider the Chinese Government's proposal for the modification of existing treaties in measure as the Chinese authorities demonstrate their willingness and ability to fulfill their obligations and to assume the protection of foreign rights and interests now safeguarded by the exceptional provisions of those treaties. **It is because of a most earnest desire to meet the aspirations of the Chinese Government the necessity of giving concrete evidence of its ability and willingness to enforce respect for the safety of foreign lives and property and to suppress disorders and anti-foreign agitations which embitter feeling and tend to create conditions unfavorable for the carrying of negotiations in regard to the desires which the Chinese Government has presented for the consideration of Treaty Powers.**

"The questions of the conventional tariffs and of the extraterritorial rights upon which nationals of the Treaty Powers reside in China are two of the important questions raised by the Chinese Government's note. Both received consideration at the Washington Conference and it is the belief of the Japanese Government that the most feasible method for dealing with them is by a constant and scrupulous observance of the obligations undertaken at the Conference. To that end the Japanese Government are ready to appoint their delegates to the special conference on tariff matters provided for in the treaty of February 6, 1922, and is furthermore willing either at that Conference or at a subsequent time to consider and to discuss any reasonable proposal that may be made by the Chinese Government for a revision of the treaties on the subject of tariff.

"Before it can form any opinion as to what, if any, steps can be taken to meet the desire of the Chinese Government in regard to the question of extraterritoriality and those special safeguards of the treaties upon which their nationals live and conduct their enterprises in China, my Government desire to have before it more complete information than has heretofore been available and the most feasible way in which the question can be approached and considered is to send to China the commission provided for in the Resolution of the Washington Conference regarding extraterritoriality in China in the expectation that the investigations made by that commission will help to guide the Treaty Powers as to what, if any, steps should be taken as regards the relinquishment by gradual means or otherwise of extraterritorial rights at this time. My Government are now ready to appoint its commissioners to sit with the commissioners of the other interested Governments in accordance with that resolution; it hopes that that commission may be able to begin at an early date its investigation into the existing conditions of the administration of justice in China and to make a report which will serve as a basis for the recommendations to be made in pursuance of the Resolution, for the purpose of enabling Governments concerned to consider what, if any, steps may be taken with a view to the relinquishment of extraterritorial rights."

The *Osaka Mainichi*, which interprets the view of many Japanese interests vitally concerned in China, interprets Japan's position as follows:

"Whereas Japan was determined at one time strictly to stick to the terms of the Washington Treaty, and to deal with the special customs conference as a natural sequence to that treaty, which

plainly stipulated the nature and scope of such a conference. It is even understood that Japan has been trying to bring about some sort of a compromise between America and England so as to offer a united front of the Powers towards the Chinese demands. But now that Japan has recognised the Chinese intention to bring up the question of tariff autonomy at the coming conference, it must with fairness be said that the Japanese attitude towards the whole question has been the subject of considerable change since quite recently. Her effort strictly to stick to the Washington Treaty has admittedly failed, or to say the least it was made in vain."

Herein comes the larger question of China's national aspiration, and it is our opinion that the whole problem must be treated henceforth from a much broader point of view. The Chinese demand for the tariff autonomy is part and parcel of her great national movement that cannot be suppressed for long. Should Japan obstinately oppose the sudden increase of Chinese tariff over 7.5 per cent., she will certainly have to receive a cross fire from China and her sympathisers. Any legitimate and reasonable proposal by China to be submitted to the coming conference should meet with Japan's sympathetic consideration, even for the mere reason that China and Japan are the two countries in the Orient that are far more closely related to one another than with any other nations of the world.

This, however, does not at all preclude the universally recognised responsibility on the part of China herself first to fulfil the necessary conditions enabling her to stand on an equal standing with the other Powers in the matter of financial and judicial relations. With all due respect to Chinese national aspirations, it must be said for the interest of China that she should by no means be so rash as to demand things for which she is not yet fully qualified. It is up to China first to reflect whether she has already done what she promised to do in order to have her claims granted.

The willingness of Japan to meet China more than half way, is, in effect a great diplomatic victory for China, if only the Chinese were really prepared to adopt a reconstruction program. Japan's constantly increasing trade in China, her growing vital economic interests in Manchuria and Mongolia her dependence upon China for raw materials, made China the first consideration in Japan's international policies. Japan is more than willing to co-operate with China and to place at China's disposal her enormous experience in the revision of treaties and the reconstruction of government. The difficulty is not that Japan or Great Britain or the United States take a relentless, "strong," attitude toward China. It is that China will do nothing for herself.

China's diplomacy is based upon the assumption of international jealousy. It presupposes that the United States, Great Britain, Japan and France can do nothing together, that if they face a serious international problem, demanding the keenest co-operation, selfish interests will triumph and these nations will sacrifice the bigger things in China for trivialities of international "face." In this China has so often been wrong. During the past month, China received a note signed by nine Powers with regard to a Judicial Inquiry into the May 30 affair. It took time to get all the Powers to agree to this note, but in the end it came, leaving China alone in her diplomacy with only Soviet Russia as a sponsor.

China is meeting the tariff problem in the same spirit. The hope is that the United States, Great Britain and Japan, which have the largest interests at stake in China and which are to lose or to gain most from any changes which may take place, will be so jealous of each other, that the tariff conference will become a quarrelsome meeting in which China will really become the mediator, the suggestor of compromises.

Without a constructive program on the part of China, the tariff conference is bound to fail to do any service to China. This is not a matter of high politics; it is business. Property rights and interests are concerned. The right to tax is the right to destroy and Japan, Great Britain and the United States want to be certain that what they have created in China, and all of which is really beneficial to the Chinese people will not be destroyed by predatory militarists and corrupt officials. They want the Chinese Government to show them that it can govern the country, can protect life and property, can curb banditry and can keep a predatory power, like Soviet Russia, from utilizing China as a buffer state for confounding the peace of the world. If China will meet this problem openly, in friendship, with a clear view toward the attainment of equality by reconstruction, Japan, Great Britain and the United States upon whom China must ultimately depend for her place in the sun, will be more than ready to make every concession.

Unification of Administrative Control of the Railroads of China

By H. E. Yeh Kung-cho, Minister of Communications of the Republic of China

[The following memorandum was presented to the Chief Executive of the Republic of China by the Minister of Communications, H. E. Yeh Kung-cho. It is to be hoped that Mr. Yeh will have an opportunity to carry out his plans.—ED.]

Too much emphasis cannot be placed on the importance of development of the means of communications. On it depends the life of modern civilization. It is the forerunner of political, economic, financial and industrial progress. Military organizations depend upon it for mobility and immediacy of information. To accomplish these, a well settled policy should be adopted. In accordance with the various conditions obtaining in different countries, the policies adopted in various parts of the world to answer their respective requirements may be divided into three classifications. They are (1) Indirect Production Policy. To help agricultural and industrial development by means of communications. (2) Direct Production Policy. Communication systems are made to yield revenue for the benefit of the national treasury. (3) Relative Production Policy. A combination of the above two policies, aiming at agricultural, industrial and economical development of the country as well as the gain to national treasury.

In view of the poverty of the government, on the one hand, and the backwardness of our industries and commerce, on the other, the Relative Productive Policy is, therefore, the most suitable for China. Both the Government and popular interests can not be overlooked. But it is one thing to have a good policy and another to put it into effect. Suitable guidance and existence of proper conditions are essential to the successful execution of any policy. An effective policy for the development of communication systems requires Unification of Administrative Control.

China has completed only 6,000 miles of railways, 80,000 miles of telegraph lines, 13 wireless stations and 28 telephone offices, during the last several scores of years since she was first opened to foreign trade. There has been no government navigation enterprise. The total registration of privately owned commercial vessels is approximately only 410,100 tons.

For the development of communications the Government has given little financial aid. Most of the capital required was raised from foreign loans and the enterprises have been, therefore, burdened from the beginning with heavy debts. Yet, prior to the Fifth Year of the Republic (1916), these enterprises were able to maintain themselves and showed steady improvement. Their development contributed also to the progress of agriculture and commerce, which were showing signs of great activity. Military movements at that time were likewise efficiently executed, without confusion and all according to preconceived plans. This was due to the fact that the power and responsibility for the administration of the systems of communications were entirely in the hands of the Central Government, in consequence of which smooth operations were secured in normal times, and orders were effectively carried out in times of emergency.

But since the Sixth Year of the Republic (1917), internal wars have been numerous. High military leaders in the provinces mistake the systems of communications as their own instruments of warfare and place these systems under their own control. They have commandeered railway rolling stock, telegraph lines and vessels. Still worse, they have often operated the official systems of communications for their own profit with great detriment to trade and industry. Even revenues needed by the railways and telegraph offices for their own maintenance have been seized. As a result, wages are not paid, and there is no money to buy the materials urgently required for repairing of equipment. Worst of all, administrative officials and the accountants of the railway and telegraph administrations are appointed directly by the provincial authorities who recklessly exploit the properties and revenues of communications. This state of affairs lends favorably to corruption.

The provinces, on the one hand, lack the means of preventing corruption, and the Ministry, on the other, is powerless to check dishonesty. Public funds have been utterly mishandled and Government credit is seriously affected. Because of failure to live up to loan agreements, international control of railways has been proposed and the discontinuation of acceptance of cable messages for dispatch abroad on credit threatened. Our official documents are full of warnings as to what may happen.

It is apparent to all that without rolling stock, telegraph lines and vessels and the proper administrative officials to operate them, no revenues can be produced. With rolling stock, telegraph lines and vessels seized and the appointment of administrative officers interfered with, the railway and telegraph systems will cease to become useful and must collapse as revenue-producing instruments. Indirectly the progress of civilization, or political, economic, financial and industrial development and of military organization and national defence is hindered. To avert the peril, it is imperative that the power of administration of the communication systems shall be centralized.

In the following we beg to submit in great detail the reasons showing the necessity of Unification of Administrative Control and the evils due to the lack of such control during recent years in China.

I. The Power of Appointment

(a) Different from the ordinary administrative departments of the Government, the communication systems require, in all ranks, men of technical training and experience. Promotions are made step by step in accordance with merit and seniority. Opportunists are discouraged, and none are dismissed without sufficient reason. With security of position and steady promotion, men are encouraged to do good work and remain in the service. So it is not infrequent to find men who remain loyal and contented in the service of communications for a long period of time. Efficient organization is thus secured. The success of the communications systems in China in former years is a positive proof of the efficacy of this system.

A change has taken place in recent years and the provincial authorities have frequently interfered in the appointment of administrative officers. Men are now being lifted into eminence from relative obscurity, and men of low intelligence are put in positions of responsibility and authority. Even dismissed employees are re-engaged, and sometimes placed in high authority. Such unfair treatment naturally reacts on the honest and deserving members of the staff. Furthermore, the newly appointed officials are either incapable of properly performing their duties because of their lack of experience or ability or have shown themselves to be corrupt and in utter disregard of the traditions and official Rules and Regulations. Enormous losses are frequently caused thereby. Those high provincial officials who interfere in the employment of men in the service of communication systems do not realize the serious consequence resulting from their desire to help their friends, and the men they put in frequently flout the orders of the Ministry, since they know that the Ministry is powerless to enforce its orders. It is said in the Classics that the government shall only be as good as the men in it and that experience should be the first consideration in the appointment of men. Where there is no definite system governing appointments and where there is no central authority to enforce rules and regulations, efficiency and proper selection of men are impossible.

(b) Men in the service of communications should be selected by examination or promoted by merit and length of service mentioned above. Their duty is to carry out the policy of the government and obey orders of their superiors as required by the Law of

Civil Service. They are merely fulfilling their duty when they do what they are ordered by the proper authorities and it can not be construed that there are political motives behind their acts. In recent years, the spirit of partisanship has been excessive and many dutiful officers in the service of communications have been dismissed, regardless of their ability and experience, just because their faithfulness toward their duties has been mis-interpreted as acts of loyalty toward some particular party or clique. It shows the lack of appreciation on the part of political leaders of the fact that men in the service of communications have been employed on the basis of their technical training and experience. Since these men can make their living best by being in the service of communications, naturally they would not risk their positions on which their livelihood depends by taking sides in political issues. In times of emergency when the systems of communication are commandeered, it is also quite natural that they can not risk disobedience to the authorities imposed on them. In so doing, they should not be considered as taking sides, nor should they be discharged on this score. If this spirit of discipline and the faithfulness toward service is disregarded, discouragement and bitter feeling will be engendered. Measures of retaliation will be adopted when a change of political power takes place. Communications will be drawn into the whirlpool of politics, and disorder and confusion will follow every change in the Government, there being no time for the administrative officials to learn their business. So in every war, we find disasters resulting from accident, collisions, explosion of munitions trains and congestion of track. Telegraph communication is delayed on account of the breaking down of the line or on account of inefficiency. The cause of all this is the failure to separate the service of communications from politics, thus making of them a toy in the political game. But on the other hand, if a settled policy is followed and the power of carrying out this policy is invested in the Central Government, men of experience and of technical training will be kept in their positions in spite of wars and changes.

(c) The first secret in the employment of men is fair treatment in the way of rewards and punishments. This is why in the communications service, where efficiency is of first importance, very strict rules are laid down in regard to the number of men to be employed and the grade of their pay. No departure from the rules should be allowed. Even the raise of a few dollars is fixed by regulations. When necessary, certain employees are required to furnish bonds. But since the breaking down of the central authority, the number of employees as well as their pay exceeds the provisions of the budget. Those who gain their places by unfair means may receive the highest pay right at the start, while others who do their work honestly may not receive their regular promotion. Furthermore, those newly appointed high officials who owe their positions to political influence are most ready to violate the established rules and regulations as well as all laws of ethics, since they know that the Ministry cannot remove them, and the provisional authorities will not know accurately what they are doing. It is usually too late to bring them to task when their corruption comes to light. Efficiency and power to check and punish misdeeds and corruption are lost when appointments are made by the provinces instead of the Central Government.

II. Financial Administration

Of the four branches of communications, railways and the telegraph lines were built largely with foreign capital. The navigation service is mostly in the hands of private concerns. The postal service yields enough revenues to maintain itself. The total amount of foreign loans including interest in this connection has accrued to \$700,000,000. Not appreciating the heavy burden or indebtedness, the provinces, seeing only the large amount of revenues derived from the communication systems, are accustomed to look upon them as a source of income, appropriating whatever funds they require. From the Kin Han Railway alone \$10,000,000 are annually appropriated by the militarists. The amount taken from other railways and the telegraph administration is also enormous. The railways and telegraph administration have even been forced to finance the purchase of warships, aeroplanes and munitions by promissory notes. High military officers sometimes even pledge the incomes of communications to secure loans directly. On the other hand, the railway and the telegraph administrations are frequently without the means to maintain themselves and are forced to borrow money at high rates of interest to pay wages and buy materials for urgent require-

ments. The total amount of money that has been detained by militarists, up to the end of the 13th Year of the Republic amounts to \$180,000,000 or \$250,000,000 including interest. It is obvious that the only source of income of communications comes from operation and it is absolutely necessary that the properties pertaining to the different systems shall be properly maintained and the operating funds protected. Moreover, business conditions vary from year to year and from district to district. To have a balanced development, the situation of all branches of communications must be considered as a whole, so that the profit of one may be used to help the development of another, the income of one district may be devoted to the aid of a less fortunate one, and the revenues of good years may be laid aside for the deficit incurred in bad times. By a systematic plan of adjustment and reserve, the enterprises of communication may be promoted and expanded to the advantage of the country as a whole. But if the funds at their disposal are taken away at will and recklessly spent for non-productive projects, leaving the various equipments to deteriorate, the enterprises themselves will suffer and the nation will go down with the decline of communications.

(b) To use the revenues of communications for their own development is the policy common to all foreign countries. China did the same thing in former years, and so the communication enterprises were prosperous with funds to maintain themselves in spite of internal troubles. Revenues were on the increase. Due to the fine equipments available as a result of the prosperous conditions, military movements were greatly facilitated. Such a condition no longer exists at present. Heavy losses are sustained, on the one hand, in consequence of military movements and, on the other, due to the detention of rolling stock by military people who use them to transport commercial goods for their own interest and gain. It is estimated that more than \$10,000,000 is lost on this score. This is only the direct loss, the indirect loss in consequence of falling off of trade through lack of rolling stock and dull business is a great deal more. The farmers and merchants too suffer for lack of the means of communications, so much so that business had to be greatly curtailed or totally suspended. Panic and uneasiness prevail; shortage of coal, of grain and of cash follows shortage of cars. Peace and order are threatened. It is hard to estimate the enormous losses caused thereby.

(c) It has been pointed out in the foregoing that the railway and telegraph systems of China were financed by foreign loans. There are yet a great many more railways to be constructed and telegraph lines to be extended, as called for by the program of construction. In view of the poverty of the Government and the country, foreign loans will be needed to carry the program through. When China is unable to pay the interest and capital of her existing loans, who will risk their money and give her further loans? Most of the materials required for construction come from foreign countries. In view of the repeated delay in payment for such materials already bought, it has become even difficult to get supplies to submit tenders. Those who take orders from the railways often demand payment before delivery or very high prices. The communications authorities are forced to agree to their terms in order to obtain urgently required materials for maintenance. The situation has gone from bad to worse. Two great dangers are before the country in consequence of the use of revenues from the communications to pay for military expenses. First, it is a direct cause of disturbance of the peace and order of the country. Secondly, if no remedy is found to meet the obligations, the threat of international control of railways and suspension of cable credit may actually take place to the great detriment of the country.

(d) The most important consideration in every business enterprise is to have proper accounting. On account of the heavy foreign and domestic loans, it is very important that the profit and loss of the Communication enterprises shall be carefully accounted for and made known to the public. This is the only way to establish the credit of the enterprises. Since the Third Year of Hsuan Tung, a system of Independent Accounts has been in existence (the system and the effect thereof are explained in another memorandum). All the accounts are carefully entered and balanced, so that there can be no mistakes or omissions. But since this system was destroyed, the men in charge of funds are free to do what they like with public money and alter the carefully devised system of the Ministry to more simplified forms to suit their own purposes. Dishonesty and corruption are thus made easy. There are even cases of alteration of entries, destruction of books and vouchers and of all documents

which would lead to exposure. At the time, the Ministry is powerless to check corruption and when the deed is done, prosecution is only in name. The destruction of this system benefits no one except the dishonest officials, while the communications enterprises and the country suffer.

All the foregoing statements are the result of personal observations, and incidents of evils are too numerous to be set down one by one in this brief memorandum. The time element has a great deal to do with the income of communications. There are busy seasons and slack seasons. Rolling stocks are needed for commercial transportations, and yet militarists take delight in detaining as many cars and locomotives as they can lay their hands on, irrespective of whether they have any use for them or not. On account of the lack of cars and the inability of the railways to handle the freight offered, or to move the goods promptly, merchants are shipping goods by water wherever possible instead of by rail. With reference to the telegraph, official telegrams are frequently several thousand words in length and sometimes trifling affairs or private persons are sent by first class telegrams, while urgent commercial messages are delayed in spite of the heavy charges paid. Business is lost on this account to foreign cable companies. The communication enterprises have come to the end of their resources. If we do not have any remedy for the situation ourselves, others will offer to remedy it for us. Look at the note of the Diplomatic Corps of February 12, 1925 on railway conditions which says in part.

"They (the Diplomatic Corps) feel, however, greatly concerned to witness the continuance of a state of affairs on the Chinese railways, which, if not promptly checked, may threaten to become permanent and will not only throttle the economic development of the country but inflict lasting injuries on Chinese and foreign trade and interests." and also:

"Foreign interests are closely tied up with the railways themselves. Not only that these railways are indebted to foreign suppliers for equipment supplied and actually in use, to the amount of tens of millions of dollars, but for hundreds of millions of dollars are the foreign bondholders of all nationalities interested in the fate of the Chinese Government railways. Unless the control thereof be taken without delay from the hands of the military commanders, who now exploit them for their own account, and the revenue be allowed again to flow into its proper channels, it is evident that the Chinese Government railways will before long become insolvent."

As regards the similar deplorable condition of the Government telegraph offices, the *North-China Daily News* in a report in its issue of February 10, states:

"The war of words which Chinese militarists indulge in preparatory to the mobilization of their armies is almost as costly as the actual conflict. According to a report recently issued by the Ministry of Communications, no less than \$20,000,000 is owed the Telegraph Administration by the various government departments and provincial warlords."

The same writer also refers to the great waste caused by the trivial and unimportant messages sent out by militarists and their staff members in the following words:

"I was told during the war between Chihli and Fengtien last year that Wu Pei-fu's staff had one day despatched over 700 telegrams. When I returned to Tientsin I chanced to receive one of these military telegrams. It read as follows: "My dear Mr..... Why you have not write me since you go away from Chinwangtao. I look forward to one letter from you as soon as you are able to write me. Soon we shall meet again in Peking and then I hope we shall have many meetings and talk about our experiences together. Please write me to post office Chinwangtao quickly, yours sincerely." There were a few mis-spellings but if they were included, the message might become almost unintelligible. The writer was a member of Wu's staff, occupying quite an important position. After the receipt of this telegram, I realized why press messages were held up for seven days. I can also appreciate the bill that now fills the debit column of the accounts of the Chinese Telegraph Administration."

When such reports appear in foreign papers, it is most likely that newspapers in foreign countries will quote them to the disgrace of our country. The only solution lies in the centralization of control and we appeal to all the members of the Rehabilitation Conference sitting here to use their best efforts and influence to restore to the Ministry of Communications the control over its different enterprises, the power to administer all affairs and to make appointments without external and illegitimate interferences.

Can Extraterritoriality Be Abolished in China?

MR. Eugene Chen is sometimes vitriolic. His attitude toward foreign nations is often offensive. His antagonism to Japan and Great Britain is incomprehensible in a man of his intellectual calibre. His uncontrolled epigrams, his bitter attacks, his slashing pen bring him a host of personal enemies and there are even some who viewed with a degree of favor his incarceration in a Chinese prison without due process of law. The FAR EASTERN REVIEW cannot join in that point of view. It has to take the attitude that any military interference with the courts of the country, any whimsical arresting of individuals by Chinese militarists is dangerous and can only lead to the perpetuation of extraterritorial jurisdiction in the country.

One often wonders what kinds of brains the Chinese militarists have when they do things of this sort. Just at the time when the attention of the world is being focussed on their country, when foreign commissions of various natures are arriving from abroad, when a commission to study into the possibilities of abolishing extraterritoriality is actually on its way here, a Chinese militarist seizes a journalist in his bed-room, places him under arrest, deprives him of his liberty, transports him to another city, throws him into prison and keeps him there without trial. If Mr. Chen has committed a crime, why was it necessary to take such steps? Why did not the procurator of the Peking district bring a definite charge against him? Why was he not tried in the Peking court? Why was he not given a chance to defend himself? Why was he not informed of the charges against him? Why was there no due process of the law?

Therein lies the crux of the importance of Mr. Chen's arrest. It was without due process of law; just as everything that is being done in China these days is without due process of law. The FAR EASTERN REVIEW is not anti-Chinese just as it honestly believes that the American, Japanese and British governments would do well by China. The FAR EASTERN REVIEW would give China fair play and would heartily support any steps to return to China her full sovereignty, to bring about a situation of full equality for China among the nations of the earth. But no one can ignore China's present unfortunate predicament, when she has everything to gain and because of internal dissensions, because of lack of government, lack of honesty and honor among her officials, the wealth and strength of the country is being rapidly dissipated. It is that that any other nation wants to take possession of China or believes that such a step would be possible. It is rather that the peace of the world is being seriously endangered by the lawlessness of China. The lack of a strong Government, the failure to maintain the law, the division of the country into feudal satrapies, the constant selfish wastage of funds and the appeals to foreign nations for assistance creates a situation wherein anything is liable to happen. The Bolsheviks are already taking advantage of this chaos to stir up further trouble in Kwangtung and Mongolia. A nation which attempts to exist without law soon becomes a prey to every predatory power on the face of the earth. That is China's position to-day.

On the other hand, China and the Powers are actually considering a revision of the treaty relations so that foreigners might at some time in not the too distant future become subject to the laws of China. How can one become subject the laws of a country where there is only lawlessness? For instance, Mr. Eugene Chen was born a British subject. Adhering to the Chinese race, having a strong sense of racial pride, he denounced his British citizenship and became a Chinese citizen. He sacrificed the rights to which he was entitled under the operations of extraterritoriality and submitted to Chinese law. Then he manages to disagree with a military commander and they throw him into prison. Had he remained a British subject he would have been entitled to the protection of the British crown. As it is, he has no protection for his life or liberty, because the Chinese Government, Chinese law and Chinese constitution are inoperative against even the smallest and least important militarists. Imagine what it is with so great and puffed-up a figure as the Tupan of Chihli. This sort of thing would have been alright in the Middle Ages. It is a very dangerous precedent in modern times when most human beings have opinions and like to express them, irrespective as to whether they please the high and mighty or not.

In a recent issue, we published the details of the Ostroumoff Case in Harbin. That case is now closed. In spite of the long detention of Mr. Ostroumoff, the case was not closed by a vindictive decision. It was not closed by any decision at all. The judge simply said that it was all over. The Peking Government had been notified that a Commission of the Signatories of the Washington Agreements were on their way to China to investigate into the courts of the country and they hurriedly notified all courts and judicial officials to get busy and clear the dockets. The Ostroumoff Case was one of those into which it was not desired that there should be too much investigation. Therefore, it was taken off the docket. It was settled. Mr. Ostroumoff has no redress for his long detention. There is nothing he can do about it all. He has been under arrest, under a protracted trial, under the mental strain of such a situation. He has lost time, health and money and there is nothing further to do about it.

Cases such as that of Mr. Eugene Chen and Mr. Ostroumoff do China no good. They simply create a feeling of distrust the world over. They frighten the foreigner living in China. They lead the foreign nations to believe that nothing good can come out of China. But more serious still: they frighten large masses of the Chinese people who live in the foreign concessions and who have experienced a more equitable system of law.

Mr. Bywater's Frightfulness

An Indirect War Scare Camouflage by Very Fictitious Fiction

MR. Hector C. Bywater, an American, who apparently has some interest in naval matters has written a book. Mr. Bywater's book is meant to be fiction but the wrapper contains photographs of two very real men-of-war—American, it is to be presumed. His fictitious book is called, "The Great Pacific War,"—a history of the American-Japanese War of 1931-33." Dealing almost entirely in futurities, Mr. Bywater predicts the improvable plausible. His book makes interesting reading for those who have nothing better to do.

In his preface, Mr. Bywater says:

"Although this book portrays the course of an imaginary war between the United States and Japan, it has not been written to support the view that such a conflict is either close at hand or inevitable. No doubt there are elements of danger in the immigration controversy, while further causes of friction may attend the growth of American commercial enterprise in the Far East. For the moment, however, the Pacific horizon is fairly free from clouds. But if war between the two nations is happily improbable, it remains a contingency that cannot be dismissed as wholly impossible."

If the war is so happily improbable, why write some 300 pages describing all its harrowing details. If there is to be no blowing up of cities, no destruction of peoples, then why give the morons a chance to get scared, to suffer sleepless nights and to develop a complex of hatefulness from which they never can recover. It is this sort of indirect propaganda which does more mischief than a direct anti-Japanese campaign, honesty and frankly so labelled. The latter is really not a menace, for he soon enough destroys himself by the bitterness of his argument and the acidity of his view of other human beings. The propagandist of Mr. Bywater's type is more skillful; he hides his bitterness beneath a sugared smile and coats his frightfulness with the angelic wings of brotherly love.

Further in his preface, Mr. Bywater says:

"Particulars of the American and Japanese combatant forces are based upon the latest and most reliable information from both countries. Japanese submarines are designated in accordance with the new system promulgated by the Imperial Navy Department in November, 1924. The descriptions of islands, harbours, and channels, in common with all other topographical details, have been carefully checked, nor has the

influence of weather conditions in certain regions of the Pacific escaped attention. Most names of merchant ships appearing in the text are actually borne by vessels now afloat. The account of cruiser and submarine raids on commerce has been compiled with due regard to existing trade routes and sea traffic. In fine, no effort has been spared to ensure technical accuracy throughout the narrative.

Why all these exact details in a work of fiction, why the correct names, the exactness of description and the trouble taken to insure exactness? Does not Mr. Bywater spoil the fictitiousness of the fiction by the realism of his war talk? Is not Mr. Bywater pushing his point a little too hard, when he is so careful to avoid a single error in his naval information while he makes so many stupid misstatements of facts with regard to Far Eastern Countries.

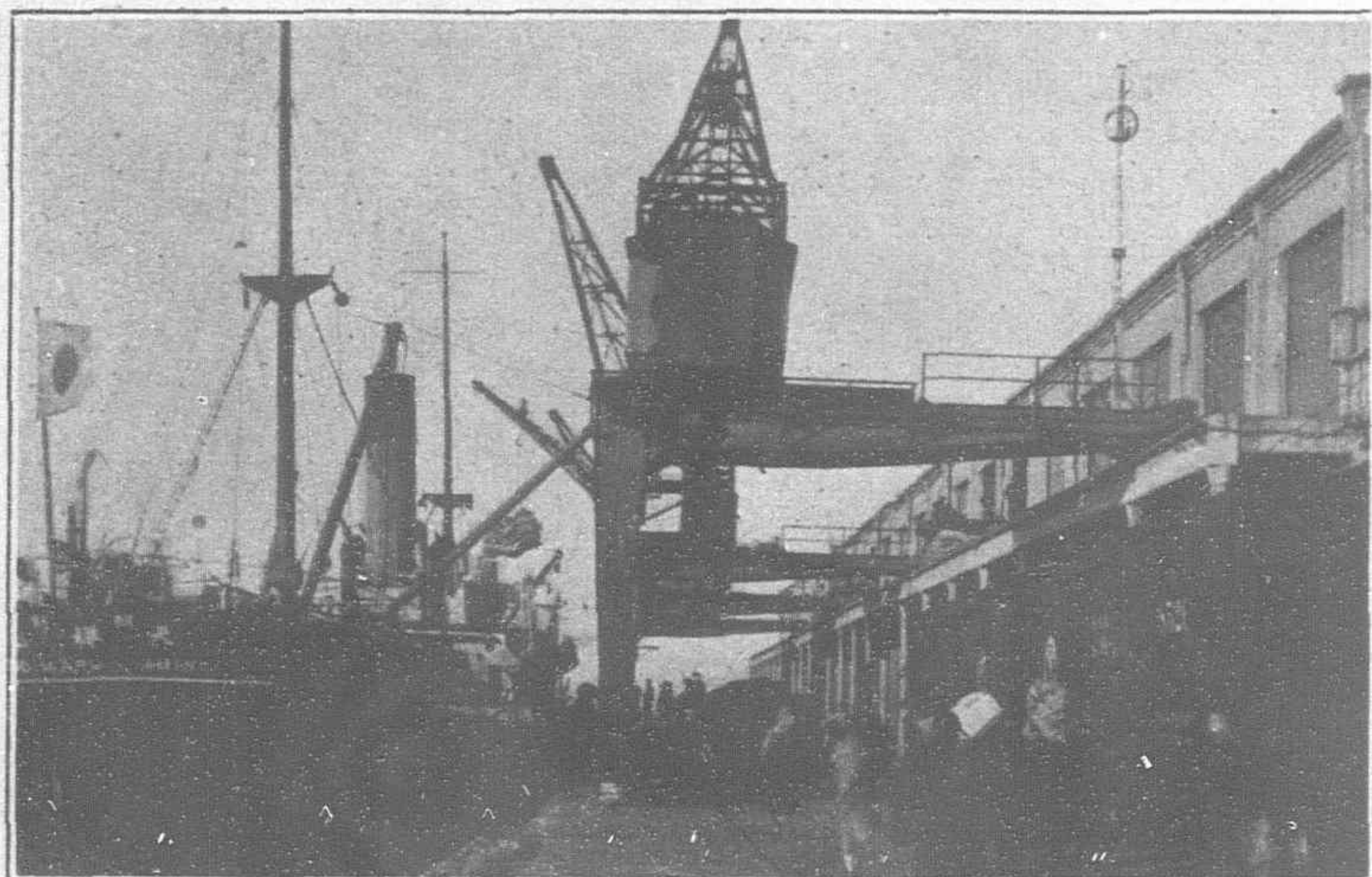
One of Mr. Bywater's most curious errors of omission is the failure to record the Japanese earthquake, although his book was written in April, 1925. He takes no account of the political effect of the destruction of Tokyo and Yokohama, nor the relationship of this disaster with any program of aggression which Japan may have had, at any time in her recent history. He pictures a Japan puffed up by war profits, without giving any importance to the other side of the ledger; to the damages of the earthquake, to losses entailed in the Siberian expedition which came to nothing, to the economic losses due to the interference with trade arising out of the disturbed state of China. Mr. Bywater's picture of Japan's economic strength is as unfair as it is untrue, for the person who is seeking a cause for fright in Japan's rapid development can easily find it in the only country, except the United States, which made money of the Great War, as Mr. Bywater says. In a word, whatever the author's intentions might have been, his book succeeds in creating a scare.

To an American living in the Far East, it often appears curious that men of responsibility should allow their minds to keep stirring up the fear psychology of the people.

If the inherent purpose is to create a sentiment favorable to the passage of army and navy bills through Congress, are there not other methods which might be utilized without stooping to a campaign which in its final analysis must make for hard-feeling and war? It is bad enough that nations have to resort to warfare to settle their troubles; need we predict this mischievous device, need we egg nations on to this iniquity, need we foretell the miseries of defeat? What is accomplished by all this warlike propaganda that is beneficial to neither the United States or Japan or to humanity at large. It leads one to believe that men who resort to such devices are lacking in a self-control, are willing to make every sacrifice for the sensation of being outstanding.

War between the United States and Japan has never been a more remote possibility than at the present time. The two nations are becoming economically so closely related that war would be unthinkable. In China, the United States and Japan are at present in harmony. The only outstanding question is one of pride and honor with Japan and can easily be settled if the Japanese immigrants are put on a quota basis just as the immigrants of other countries are. This will probably be done before long as there is a growing sentiment in the United States for such a solution of the problem. In the Pacific there is no outstanding question between the two nations. There is nothing that either nation has that the other wants. Mr. Bywater attempts to build up a strong case on the basis of a rejuvenated China; yet, he could not have foretold when he wrote his book that at the height of the recent troubles, the boycott and strike, a Sino-Japanese friendship Association should have been organized in Shanghai of which the most prominent Chinese in the city are members. Mr. Bywater could not have foretold that because he did not desire that such a contingency should have arisen. For in friendship lies the seed for the end of all wars.

The Reconstruction Number of THE FAR EASTERN REVIEW, devoted to the rebuilding of Tokyo and Yokohama may be purchased at THE FAR EASTERN REVIEW, 16 Jinkee Road, Shanghai, or through bookshops at \$5.00 per copy,



Modern Crane Facilities on Dairen Wharves



Modern Warehouses to Handle Perishable Goods

The Development of the Port of Dairen

THE efforts of the administration of the Kwantung Leased Territory and the South Manchuria Railway to make Dairen the premier port of the mainland of Asia continues uninterrupted, in spite of the general depression of trade in the Orient and the burden the Japanese Government carries in the reconstruction of Tokyo and Yokohama. Dairen has not been permitted to suffer because of other economic programs of the Japanese government. As a matter of fact, a plan of improvements has been entered upon which will not be completed until 1937.

Among the improvements are the Fifth and Sixth Wharves which are expected to be completed in the fiscal year 1931, by which time the cargo-working capacity of the Port of Dairen will be twice as large as at present. Prior to that, the Fourth Wharf now under construction will be finished in the fiscal year 1928, thereby increasing the cargo-handling power by about 30 per cent. over the present status.

With double the existing capacity, all possible increase in the cargo-working requirements will be fully met 7 or 8 years later, that is, till about 1937.

As regards the loading of coal for export purposes, the loading capacity at the Dairen Wharves has scarcely kept pace with the steady increase in export.

A few years hence, a coal pier of extensive proportions is to be constructed at Kan-chingtzu, on the other side of the Dairen Bay. The car-dumper now under installation at the First Wharf is to be used exclusively for loading bunkers.

Next, the Port of Dairen will be enlarged eastward although on a limited scale, and then to be expanded westwards to the shores of Shokoshi (Chinese Quarter of Dairen) and even beyond.

The new wharf Pavilion, which was completed a year ago, together with the new Viaduct, was opened on December, 1. By

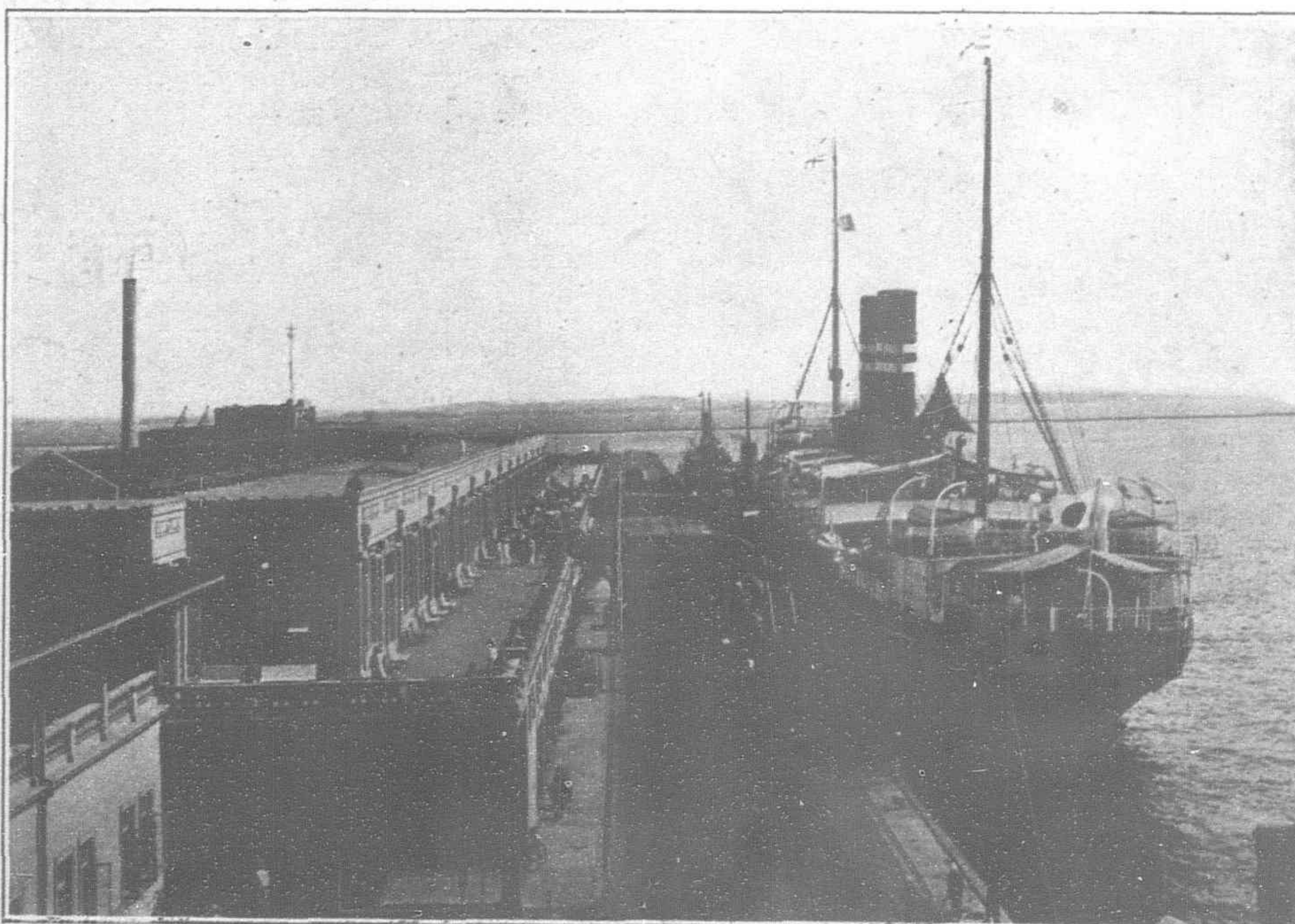
means of this viaduct which constitutes a safe, pleasant passageway from the entrance to the Wharf Compound direct to the handsome porch of the new magnificent Pavilion, all people having access to a regular passenger liner at berth in Dairen. All interruption of traffic, attendant on a level crossing, has been done away with. In the second place, any one may reach the pavilion on foot, or in a vehicle, including the trams, in rainy, stormy, cold, and hot weather, so being saved the necessary trudging between the vehicle and the steamer, not to mention the risks of a possible accident. In the third place, the port of Dairen will give a much better impression to a visitor of any nationality landing fresh from a steamer. At any rate, to our best knowledge, the combination of a viaduct and a pavilion with the latter's movable staging stairs connecting the pavilion with the steamer is certainly a happy and, at the same time, novel one that is quite original and has no peer at least under Japanese management. This is one of the most notable improvements to the Port of Dairen, and their completion was appropriately celebrated on December, 1.

At the opening ceremonies, President Yasuhiro, of the South Manchuria Railway, explained the plans of the railway administration in connection with Dairen :

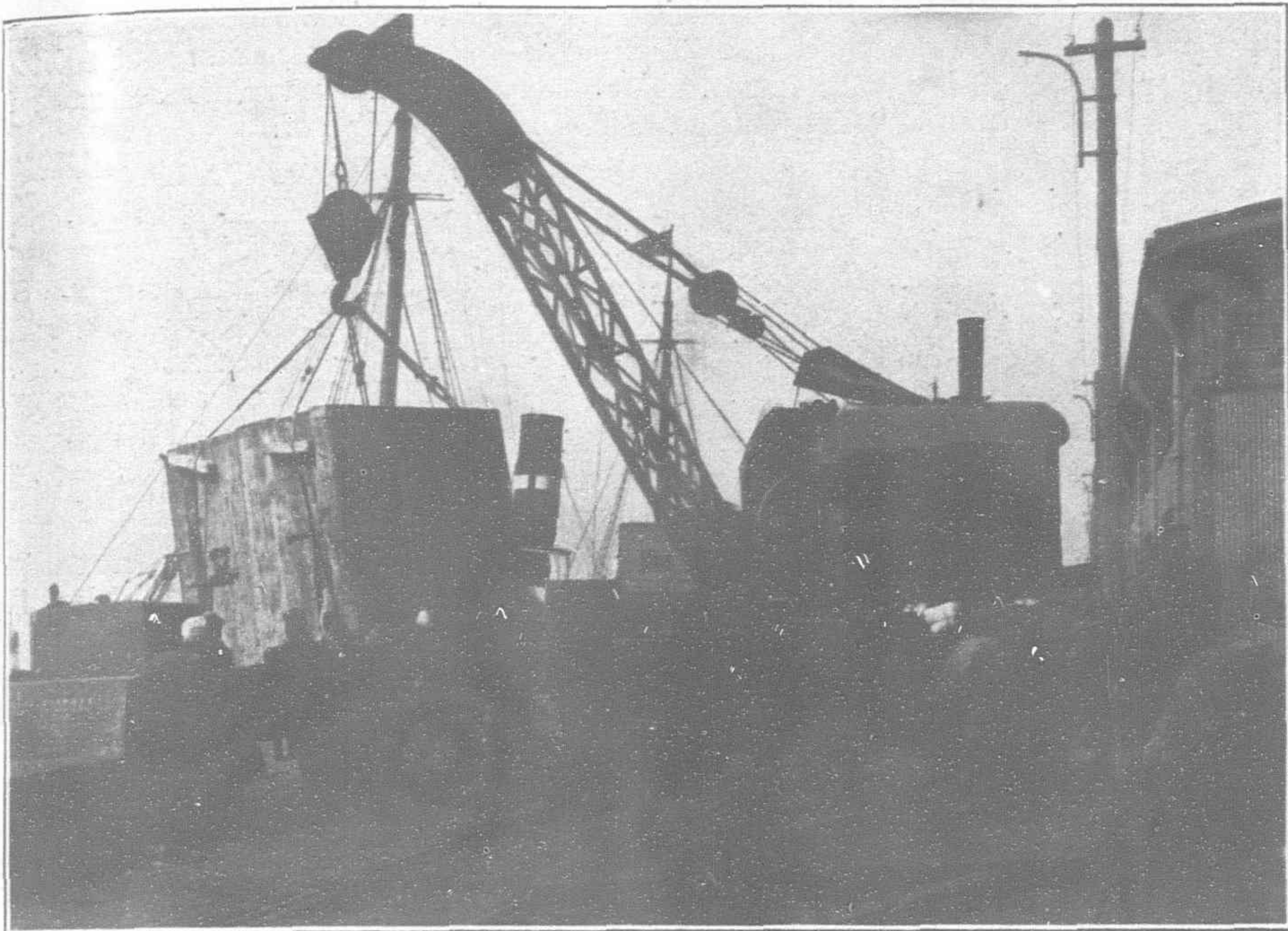
Now that the Port of Dairen has grown into one of the first

gateways of commerce in the Orient, handling hundreds of millions of yen worth of goods annually, the South Manchuria Railway Company has been spending an enormous sum of money for perfecting its equipments to the one end of raising its capacity of transport and communications.

The railway company, keeping in view its noble mission, pledged itself not to relax its effort to improve the public facilities attached to the wharves of Dairen for promoting the welfare of mankind, and to this end, hints and suggestions are cordially welcomed.



Dairen Wharf Pavilions



Steam Crane, Dairen Wharf

The growth of the Dairen wharves was on this occasion described by Mr. Ichikawa, superintendent-General of the Railway Wharf Office. He said : that, in 1908, the exports and imports for Dairen combined amounted to only 770,000 tons. He then continued : Last year, altogether 3,200 vessels, totalling 8,000,000 tons gross and carrying 6,000,000 tons net of goods, put in the port, making it one of the leading ports in the world.

Since the port of Dairen has taken such long strides the South Manchuria Railway Company has found the best part of its attention engrossed with the equipment for berthing steamers, the storage of ships' cargoes and railway freights and the general cargo-working.

Again, the thoroughfare at the entrance to the Wharf Compound being a level-crossing, traffic had to be necessarily blocked too often much to the inconvenience of the general public. This inconvenience and those discomforts alluded to above have been removed on the completion of the new Pavilion and the Viaduct, not to speak of the safety of traffic ensured.

Minato (Harbour) Bridge, by which appellation the major portion of the Viaduct is known, is 1,242-ft. long and 144-ft. wide, having a gradient of 1/26 on the southern side and 1/25 on the Wharf Office side. It has cost about Y.620,000 in construction, work being started in August, 1923. It was finished in November, 1924.

The Pavilion is built in reinforced concrete and is two-storied. The lower floor is used as a warehouse. The roof garden is about 1,000 tsubo in area, affording an excellent promenade in the warmer months, commanding an unobstructed view of the entire Harbour. The total floor space is 1,522 tsubo. It is 84-ft. by 480-ft., with a verandah, 18-ft. by 804-ft. The Pavilion can accommodate 5,000 people at a time, and has cost about Y.480,000, the per tsubo cost being Y.158. The work was commenced in July, 1912, and was finished in October, 1924.

There is a covered corridor, 48-ft. by 402-ft. It is also made in reinforced concrete.

Underneath the corridor, there are the Customs Examiners' Office (528 tsubo) and the place of rendezvous for the foremen and coolies making up the cargo-working gangs, who belong to the Shipping Office of the Railway Wharf Office (984 tsubo).

The construction has cost about Y.180,000 and was commenced in August, 1923, being finished in October, 1924.

Shore & Marine Installations & Trade
Wharf Installations

A detailed report on the development of shore and marine installations at Dairen is indicative of the tremendous work done by the Japanese government and the South Manchuria Railway. It will be difficult to identify the present Dairen by what was left by the Russians to the Japanese, except for part of the general outline, as designed originally by the Russians.

Already the sum of Y.45,000,000 has been expended for all the improvements.

Marine Installations

The Marine installations are as under :

Breakwaters	...	...	13,000-ft.
Water area sheltered by breakwaters	...	...	950,000 tsubo
Berthing quay line :			
First Wharf	...	...	2,525-ft.
Wharf A.	...	...	1,144-ft.
Second Wharf	...	...	4,424-ft.
Wharf B.	...	...	900-ft.
Third Wharf	...	...	4,400-ft.
Total	...	...	13,399-ft.

Wharf C and the Fourth Wharf are now under construction. On their completion, the quay line will be increased by 5,500-ft.

Berthing Sections ; from I to XXXIV, capable of berthing 34 vessels of 3,000 ton class at a time.

Inflammable Goods Pier (also used for loading Bean Oil) ; it had 1,000-ft. of berthing space, but was destroyed in a recent storm and swept away. A new one under construction.

Depths in Basin : 30-ft. below L. W. O. S. T. on an average, with 36-ft. and 23-ft. for the maximum and minimum depths respectively.

Steam tenders (for berthing and unberthing and towing steamers, for ice-breaking, and for life saving purposes) 16.

Lighters (made of steel) 28, with the total loading capacity of 6,100 tons.

Junk Wharf (in Russia-Machi west of Basin) 2,000-ft.

Shore Installations

Area of Wharf Compound, about 500,000 tsubo.
Warehouses & Goods Sheds, 76 having 100,000 tsubo in area.
Open Storage Ground, about 65,000 tsubo.
Storing Capacity of Wharf Compound, 800,000 tons.
Maximum Storage Record, 620,000 tons.

Passengers' Pavilion : It is on the Second Wharf, with the total floor area of 1,500 tsubo, and is for the use of incoming and outgoing passengers on the Japan and Shanghai regular lines.

Cargo Shifting in Wharf Compound. Officials and labour gang, put together, 5,000 people ; total length of shifting sidings, 60 miles ; shifting engines, 15 ; shifting goods cars (of 33 tons each) 250 ; motor trucks and electricity driven motor trucks, dozens of them ; daily working hours, 10 ; daily cargo-working capacity, about 20,000 tons.

Export of staple products in 1924 :

	Piculs
Beans	34,395,883
Bean Cake	44,978,568
Bean Oil	13,557,591
Other cereals	13,203

Trade Returns in Value in 1924 :

	Hk. Tls.
Imports	107,914,098
Exports	141,304,757
Total	Hk. Tls. 249,218,855

Both exports and imports combined amounted to Hk. Tls. 240,000,000 equivalent to G.Y.400,000,000.

Among the China ports, the port of Dairen ranked the fifth in 1908 after Shanghai, Hankow, Canton and Tientsin in trade volume. In 1922, Dairen rose to the third place after Shanghai and Tientsin, coming down to the fourth in 1924 after Shanghai, Tientsin and Hankow.

The Port of Dairen, compared with the port of Kobe, in regard to its foreign trade, exported 5,200,000 tons as against 4,800,000 tons for Kobe in 1923.

How such a disparity of value divides the trade totals of the two ports is because exports from Dairen consist chiefly of such minerals and agricultural produce, comparatively cheaper priced, as Coal, Bean Cake, Beans and other cereals.

Future Installations

The installations constructed in the past and existing at present are as roughly tabulated above.

The increase rate of the exports and imports of the port of Dairen has been figured by the past records at about 300,000 tons a year.

Ten years hence, the increase by 3,000,000 tons may be expected, and according to the present plan, this port may be exporting and importing 30,000,000 tons of goods a year.

Cargo-working Conditions

The chief business of the Wharf Office, Dairen, consists of handling steamers and their cargoes, together with the handling of railway goods and warehousing business, including all auxiliary business appertaining thereto.

All these business are being carried on exclusively by the Wharf Office.

In the port of Dairen, all steamers above 1,000 tons gross each, must be berthed and unberthed by obtaining the services of one of the authorized pilots. In other words, a compulsory pilotage system is in operation.

As matters stand, Sections 1—4 are set aside for coaling exclusively; Sections 5—9 for imports; Sections 10—11 for use of the passengers on the Japan and the Shanghai Liners; Sections 12—23 are used both for exports and imports; and Sections 24—34 are for exports exclusively.

The Wharf Compound is roughly divided between the goods sheds zones and the warehouse zones.

The goods sheds zones are for temporary storage of goods landed from steamers and to be loaded into steamers.

The warehouse zones are for storage of goods for a considerable period.

Ships' cargoes, when landed in the goods zones, will be delivered to the consignees. Such as are not taken delivery of at once are shifted into the warehouse zones, so as to make room in the goods sheds zones for future arrivals.

Goods arriving by railway at the Dairen Wharves from the interior are unloaded from the goods cars in the warehouse zones.

Among goods, Beans are mostly taken delivery of by the local Bean Mills to be made into Bean Oil and Bean Cake. Bean Cake is carried into the Wharf Compound for storage in the warehouse zones.

In 1923, Beans that arrived at the Dairen Wharves by train, amounted to about 1,700,000 tons, of which about 1,000,000 tons were handed over to the local Bean Mills, that turned out from these Beans about 33,000,000 pieces of Bean Cake in the same year.

In loading into steamer goods kept in storage in the warehouse zones, they are first shifted into the goods sheds zones, according to the order of the applications.

Thus, the goods are being shifted about constantly between the goods sheds and the warehouse zones, so as to make most of the warehouse zones or the quay line available.

The shiftings of the goods in the Wharf Compound may be likened to the blood circulation in the human body. The more regularly and quickly the shifting operations are effected, the higher will be the rate of the efficiency in cargo-work, so much the more raising the utility of the quay line.

These shifting operations are executed mainly by means of shifting engines, but, in addition, motor trucks, electricity-driven lorries, carts, etc., are used.

On this account, the area adjoining the Wharf Compound available for storing goods is kept as spacious as possible, in order to facilitate the shifting operations.

The daily cargo-working capacity of the Dairen Wharves is 30,000 tons with the daily shifting capacity of 20,000 tons. The daily

cargo-working capacity for a steamer is 3,000 tons Beans and other cereals, 2,000 tons Bean Cake and Coal, and about 800 tons of imported cargo. The figures naturally variate according to the ship's size, but one with 4 holds is spoken of.

Coolie Force

The manual labour on the Dairen Wharves is undertaken at present wholly by Chinese coolies.

They number about 6,000 in summer months, and about 14,000 in winter months.

These coolies come principally from Shantung, the majority of them being unmarried.

Supply of these coolies is contracted for with the Fukusho Co. (Mr. Y. Aioi, Proprietor, who has been Chairman of the Dairen Chamber of Commerce from the very beginning).

These coolies are grouped together in the Wharf Coolies' Quarter at Jijiko (above the Wharves) inclosed with brick walls, and containing rows of brick dwellings.

The Chinese coolie is, as a rule, strong physically, and can carry 4 pieces of Bean Cake at the same time. The strongest of them can manage even 8 pieces at the same time, and such instances are by no means rare.

In hiring coolies, the Fukusho Co., put them first through the strength test. Of the army of 14,000 coolies, the majority have been at work on the Wharves over a dozen years, and have acquired a high degree of skill in the lines of their trades.

The Fukusho Co., pays these coolies according to kinds of work at so much per ton.

These coolies earn about 80 cents a day on an average.

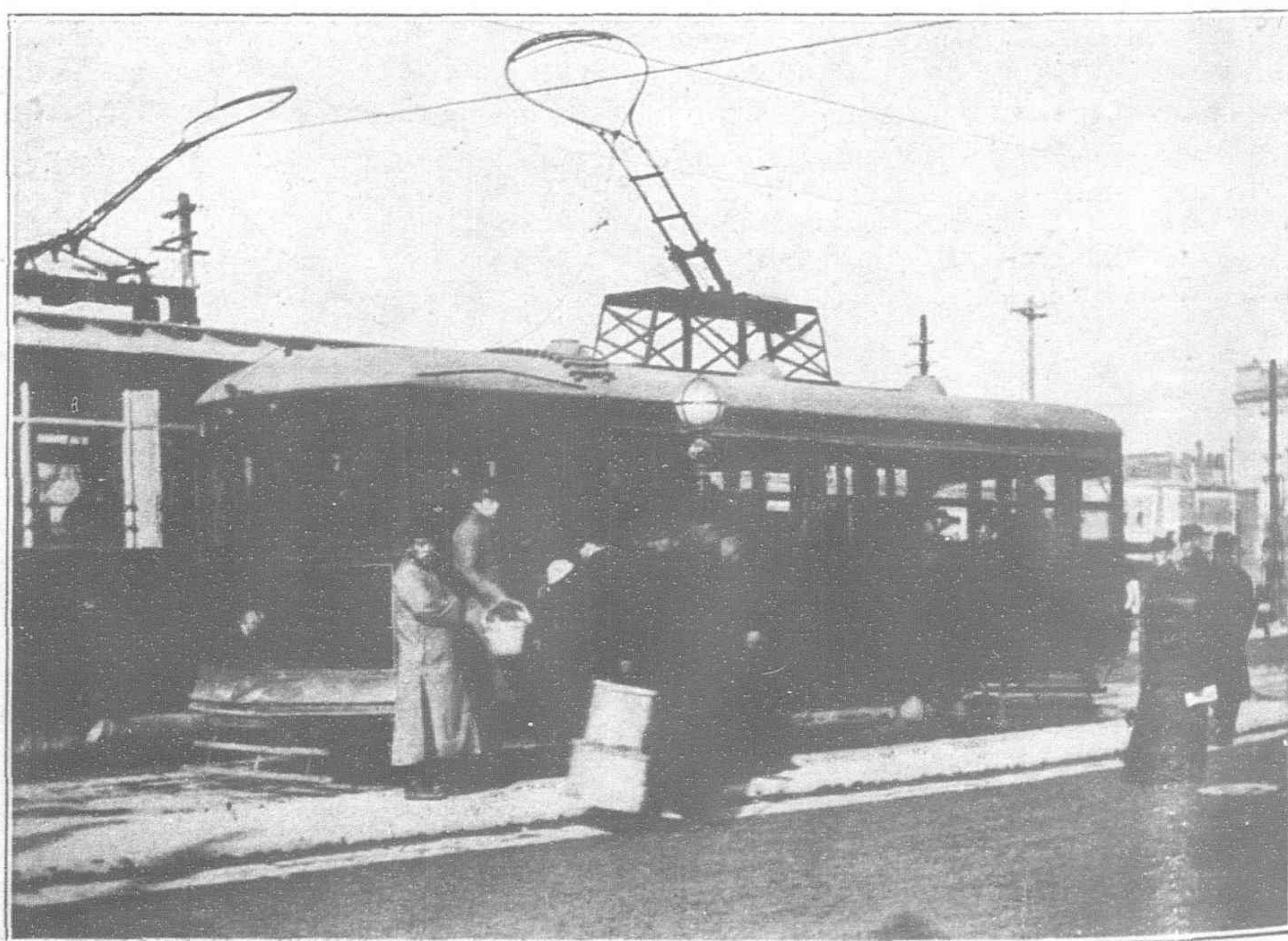
The Chinese coolies are very simple and live a very simple life. They are on a very low level intellectually, and some of them can not tell their own ages or even names, much less write their names. They are, however, faithful and best suited to working collectively.

Mechanical Installations

As already reported, most of the work at the Dairen Wharves being done by the Chinese coolies, there are only a few mechanical installations worth mentioning. The cranes, motor trucks, electricity-driven lorries, conveyors, and other machinery may be appraised at about Y.1,000,000.

As noted already, the exports from the port of Dairen consist of Coal, Bean Cake, Bean Oil, and other cereals, that are shipped in large quantities. Accordingly, mechanical appliances may be employed to advantage.

For the immediate purpose, a coaling vessel has been purchased, and is expected here in October. She has a capacity for 200 tons bunkers per hour. Again, three bunker loaders of the Michener system are now under installation, each having a 100 ton capacity per hour. Besides, car-dumpers, each capable of loading 1,400 tons per hour into steamer, are to be fitted up during the current year.



Berny Type Electric Car, Dairen

Petroleum in the Philippines

By Warren D. Smith

PETROLEUM gives some promise of proving to be an asset. The drilling operations now in progress on Bondoc Peninsula, Tayabas Province, Luzon, are of great interest in this connection. Here the Richmond Petroleum Company, a subsidiary of the Standard Oil Company of California, is drilling on the most favorable-looking structure I have yet seen in the Archipelago. If its borings are not successful on this structure after three or four holes are put down, further boring in the Philippines would seem to be a doubtful venture. The first hole in which only a very slight "show" of oil or gas was obtained was abandoned at 400 meters (approximately) owing to caving. A second well on Amuguis No. 2 is now (July, 1922) over 800 meters deep. Some water and gas have been encountered but no oil.

Petroleum seeps in the Philippines have been known for many years. In view of the presence of petroleum in commercial quantities in Borneo to the southwest, and Formosa (though in much smaller quantities) to the north, and the worldwide demand for petroleum and its products, great interest in the Philippines as a possible producer is natural. The result of the present operations of the Richmond Petroleum Company on Bondoc Peninsula is of more than local interest. Should a commercial supply of oil in the Philippine Islands be secured the effect upon political, military, and commercial problems will be profound.

The principal source of oil in the Philippines is the group of shales, with intercalated limestone beds, to which has been given the name Vigo, from the type locality on Vigo River in Bondoc Peninsula.

The typical oil shale on Bondoc Peninsula may be described, quoting from a report of Pratt and Smith, (506) as consisting—

... of fine-grained shale and sandy shale interstratified in thin regular beds from 5 to 10 centimeters in thickness. Occasional beds of sandstone occur varying from 10 centimeters to 1 meter in thickness. The fine-grained shale is gray, blue, or black, and is made up almost entirely of clay. ...

The blue or black, fine-grained shale in the

Vigo formation usually emits a slight odor of light oils upon fresh fracture, and in some outcrops is highly petroliferous. The material loses this odor and assumes a light gray color after it has been exposed to the air and has become thoroughly dry.

These shales contained numerous Foraminifera of the genus *Globigerina*, which may be the source of the oil. Although they are numerous, these organisms did not appear to comprise a large percentage of the volume of the shales. However, shales from Leyte and Mindanao contain them in large numbers.

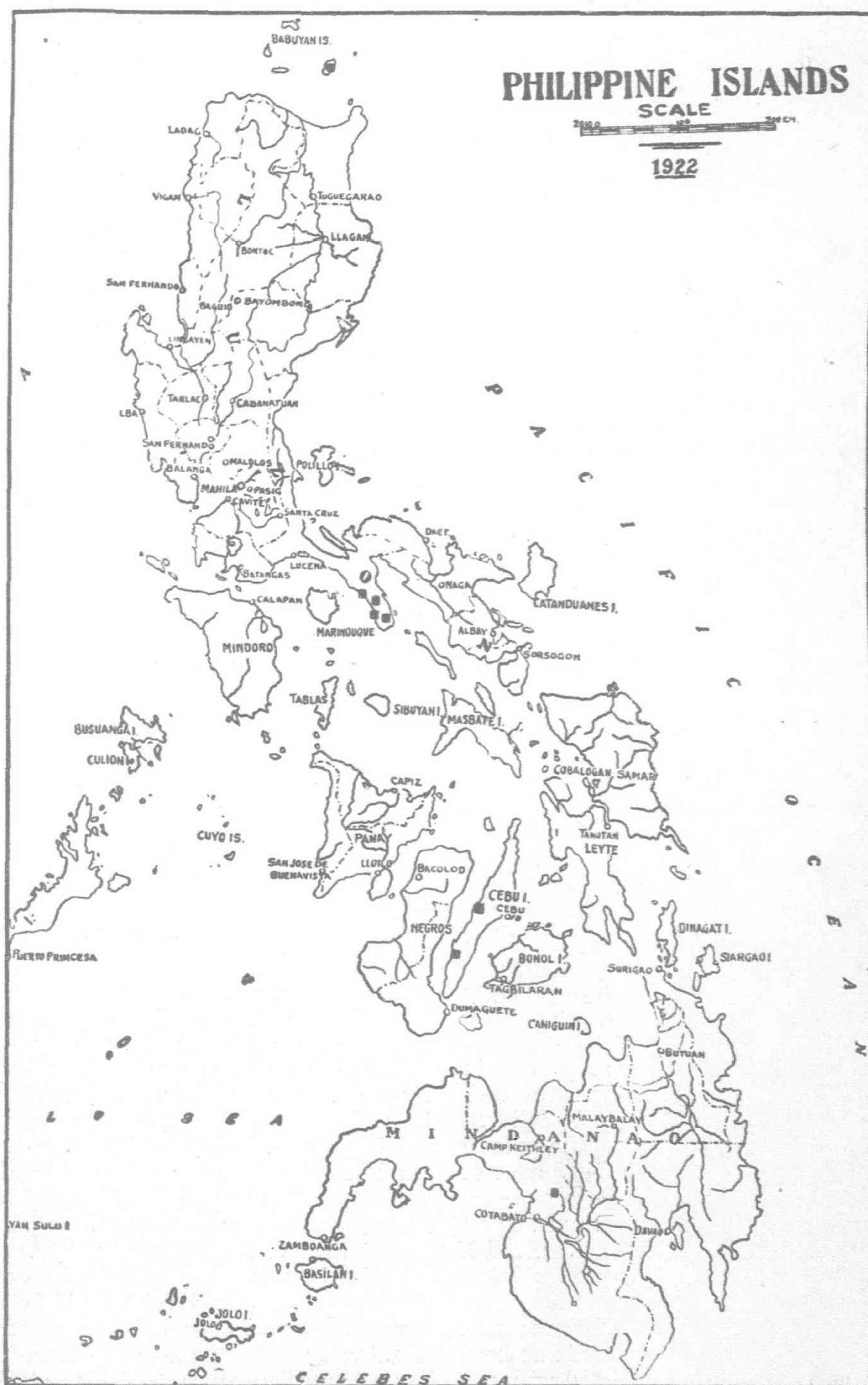
The Vigo shales are found to be hundreds of meters in thickness in several parts of the Islands and much thinner in others. The age of the shales is middle Miocene; they are easily recognized by certain index fossils which have been determined by paleontologists. Some of the most characteristic are the round, globular

protozoan, known as *Globigerina*; a small bivalve shell, *Corbula socialis*; a flat-topped cone shell, *Conus ornatus*; another gastropod, or snail, with a high spire and very much tuberculated, *Cerithium jenkinsi*; and a much-coiled cast of a worm borer, *Vermetus javanus*. These fossils are well known in connection with the oil shales of Java. Specimens of them may be seen in the Bureau of Science collection.

The Canguinsa sandstone, a buff-colored, very porous, and somewhat tuffaceous formation above the Vigo, may prove to be the reservoir for holding the oil.

Structure.—It has long been known that an important condition for the accumulation of commercial supplies of oil is the anticline, or arched flexure, of the rock strata. In southern Sumatra, according to one authority, no oil has been obtained in commercial supplies except by boring on the crests of these anticlines. The double flexure, where the anticline plunges at both ends, forming a dome, affords ideal conditions. By no means all of the productive wells in the world are located on anticlines, but in a new country it is desirable to locate the most favorable structures for "wild-cattling."

Location of prospects.—The chief seeps and most promising prospects are located as follows: Bondoc Peninsula (lower



Petroleum in Philippines



end), Tayabas Province, southeastern Luzon; the ozocerite veins near Villaba and the asphaltic tuff near Baliti, both in the north-western part of Leyte; Pidatan district, in central Mindanao; the west coast of Cebu, from Alegria north, to and perhaps beyond Toledo; natural gas from some deep wells in Tertiary shale on the eastern flank of the cordillera and the low country to the east on Panay. Other seeps have been reported from the southern end of Mindoro and from Siasi Island.

All the known oil seeps, petroleum residues, and natural-gas emanations in the Philippines are associated with Tertiary or later sediments.

Special localities.—In Bondoc Peninsula, the seeps are in highly inclined strata which are probably in all cases part of anticlinal and fault structures. From this association it is believed that the petroleum in this field has, in accordance with the general law of petroleum accumulation, tended to collect in the crests of anticlines.

The petroleum occurs, associated with certain horizons, in an extensive series of beds of sandstone and shale (Vigo shale), which is similar in character to the oil-bearing rocks of productive fields, notably those of Japan. The principal seeps are found in the upper part of this series in a zone designated by Pratt as the Bacau stage, which is predominantly shale but which contains subordinate beds of sandstone. In its seepage, the petroleum is associated with the shale rather than with the sandstone, and may be observed in

some cases to come directly from the shale. Beneath the surface, where closed lenses of sandstone probably exist, one would expect to find the principal accumulation of petroleum in the more open, sandy zones. At the surface the light oil appears to have escaped readily from the coarse-grained beds, and to have been retained only in the fine-grained shale.

The structure of Bondoc Peninsula includes a number of anticlinal folds; the conditions along some of these anticlines are considered favorable for the accumulation and retention of petroleum, whether it occurs in all or in any one of the horizons at which it is suspected to occur.

The localities enumerated below are considered some of the more promising as sites for the location of "wild-cat" wells in exploring the petroleum bearing rocks of Bondoc Peninsula. However, owing to conditions discussed in Pratt and Smith's report, cited above, it is possible that oil may be encountered at any one of the sites, even though it be absent elsewhere. There are many places other than those listed which would be considered as favorable, in case exploration of any of the sites herein recommended prove successful.

1. The Maglihi anticline in the southeastern part of the peninsula, near Mount Morabi.

2. The Maglihi anticline in the valley of Bahay River.

3. The central anticline in the vicinity of Balinsog or Bacau. Recent work shows that earlier reports of the structure of this need modification; parts do not appear to be altogether suitable. The Richmond Petroleum Company of California has drilled one hole to a depth of about 400 meters, which caved, on the Amuguis anticline just south of the central anticline. The rig has been moved about 3 kilometers farther north, higher on the structure, and the hole is now over 800 meters deep without any results (July, 1922).

4. The Ayoni anticline, about 1,500 meters inland from the mouth of Ayoni River on the west coast.

5. The Malipa anticline, near Cabongahan.

Leyte

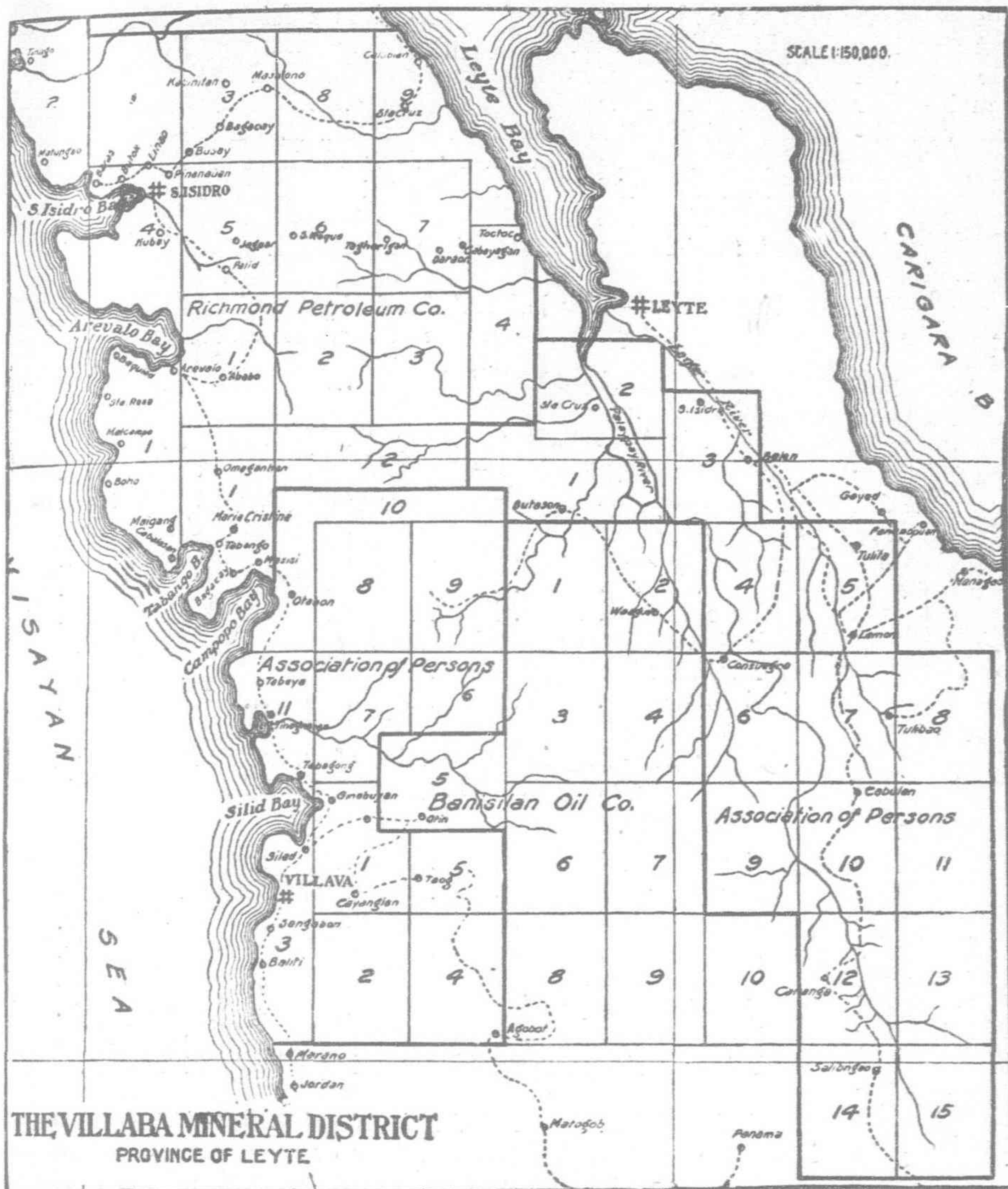
It has been known since 1890, at least, that petroleum existed near Villaba, Leyte.

Rock "asphalt" was discovered in 1913 by a Filipino forest ranger, and a period of active claim staking followed. Not until 1918, however, was the deposit opened commercially.

The extreme northwestern peninsular portion of Leyte, as far south as Baliti, is worthy of careful exploration. The geologic formations here, according to Pratt, (494) are a continuation of those on Bondoc Peninsula.

Petroleum is encountered at two places in Leyte; it seeps from the upturned edges of the Vigo shale, and oozes from the base of a hill which consists of a clayey tuff-sandstone belonging to the Canguinsa. Residual bitumens occur in the Canguinsa and in the Malumbang series; one questionable outcrop of solid bitumen was observed, in loose debris, which appears to overlie the Vigo shale; and a heavy, black oil, or viscous bitumen, was found in sandstone near the base of the Vigo.

The bitumens in the Canguinsa are encountered in five types of deposits as follows: (a) Solid bitumens, in lenses or pockets which tend to follow bedding planes, but which also cross the bedding irregularly along fractures and cavities; (b) solid bitumens, in regular fissures, which penetrate the clay-tuff independently of bedding planes; (c) non-uniform mixtures of bitumen-impregnated,



which flows almost due south. This is a swift and almost unfordable tributary of the Rio Grande.

Transportation to the seep is first by launch from Cotabato to Fort Pikit, thence by horse and cargadores up Malitabug River, thence across country to within about 1.5 kilometers of the oil seep. The rest of the way is made on foot. The trail as far as the forks, close to Banisilan, is a fairly good one; from there it ascends gradually to an elevation of between 750 and 900 meters, and is exceedingly rough in places. The country is practically uninhabited, and side trails are few. Tall grass (cogon and talahib) runs riot, and much of the country is fairly deforested. With the exception of Banisilan, where there are a Constabulary outpost and a Moro farm school under the able supervision of Mr. Manion, there is no settlement worthy of the name. The country is exceedingly wild and beautiful and capable of great development. There is a Government herd of cattle here, the only one in hundreds of square kilometers of country.

The geology of the region, briefly stated, is as follows: The principal formation as indicated on an early map published by the division of mines of the Bureau of Science consists of Tertiray sediments, limestones, sandstones, and shales. These are intruded on the edges of the field by igneous rocks, principally basalts and andesites. There is considerable agglomerate in the region. Owing to these intrusions, and also to more-widespread regional earth movements, the sediments have been folded and faulted, as in other parts of the Archipelago—some of them, especially the lower series, including the Vigo shales, very profoundly. In the region adjacent to the seep the formations which might be counted upon to contain oil are so badly disturbed that no regular structures could be made out; and, as knowledge of the geologic structure is necessary in locating an oil field, a favorable consideration of this locality cannot be entertained. I do not mean to say

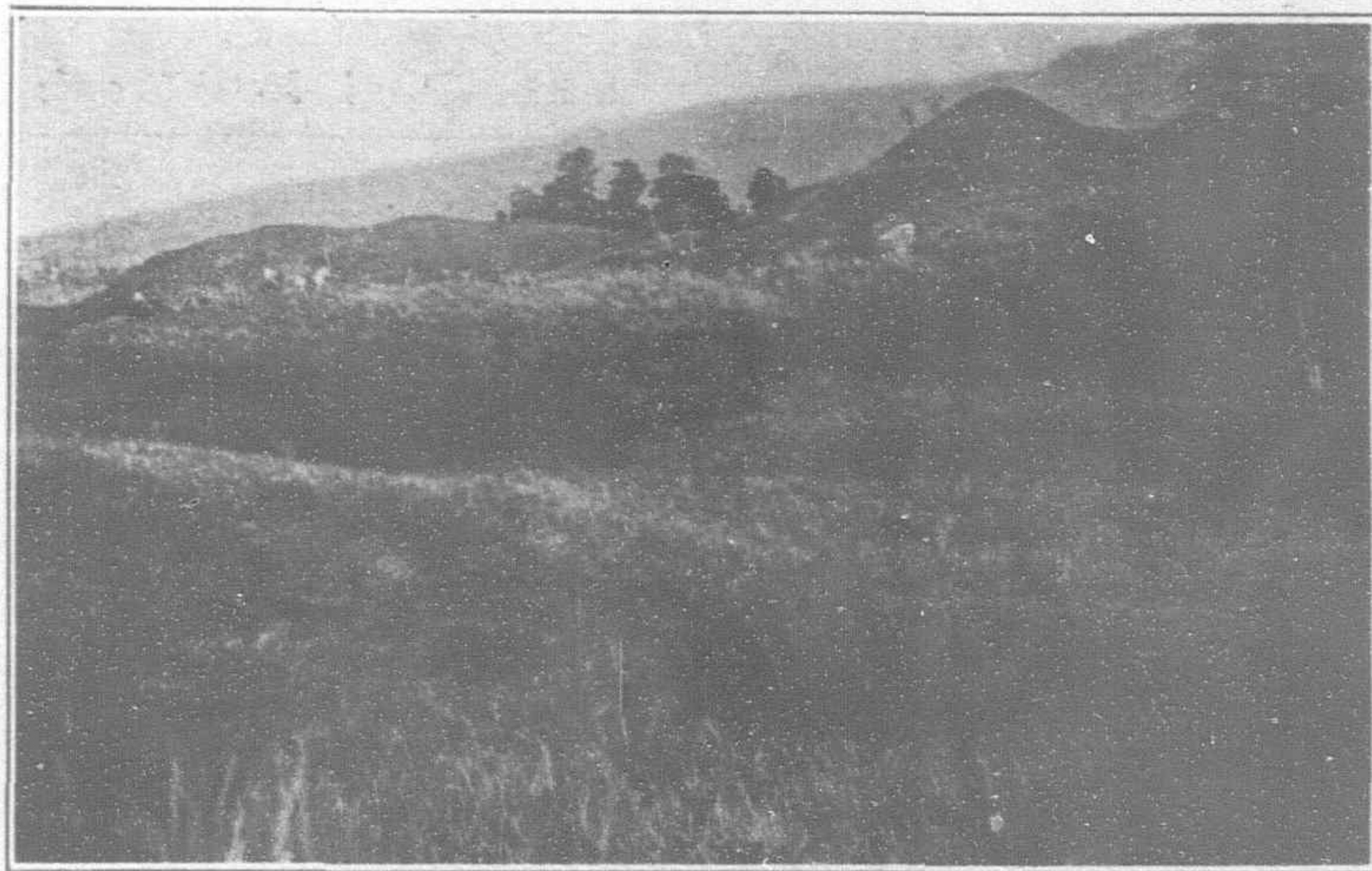
that no oil exists there: it might even be there in fair quantity; but with other difficulties, already referred to and which must be considered, it does not promise to be an economic undertaking. This is a feature which many would-be oil producers do not adequately consider.

The seep under discussion is located in a small ravine, the headwaters of Kirusoy Creek, a tributary of the Malitabug, on the side of a partially wooded range of igneous rock and on the south side of an east and west dike extending from the main igneous mass. Apparently, there is a fault at this point, as the oil is seeping out along a considerably slickensided surface. On the hanging wall there is a much broken mass of material which may be either agglomerate, locally brecciated igneous rock, or merely

Mindanao

The Pidatan field was investigated by me late in February, 1921, in company with Pittsburgh (Pa.) oil men and geologists. About one week was spent on the ground in the vicinity of the petroleum seep. It was the consensus of the entire party that the immediate vicinity of the seep did not show sufficient favorable indications to encourage drilling in that particular region, but it did seem justifiable to consider further geologic exploration in the surrounding territory in Cotabato Province.

The field investigated is situated about 60 kilometers due north of Fort Pikit, Cotabato Province, which in turn is situated some 70 kilometers up the Rio Grande de Cotabato and, therefore, is very nearly in the heart of the great southern island. To the north of the field lies the volcanic range containing the active volcano of Mount Ragang, which in turn lies just south of Lake Lanao. To the west runs the line of hills and mountains known as the Babuy Mountains. To the east there are some moderately high hills and mountains of limestone, of which Mount Kitubud is the outstanding feature. The principal stream through the field is the Malitabug,



Topography in the vicinity of Pidatan oil seep, Mindanao

talus. Little oil or gas is issuing at this point. The location and the composition of the oil (which has none of the light fractions and very little either of paraffine or of asphalt) indicate local and abnormal conditions. Compared with other seeps seen in other parts of the world by members of our party, this one was disappointing.

Cebu

Just prior to the outbreak of the insurrection of 1896 an English company had started drilling on the Smith Bell Estate near Toledo, Cebu ; but with the coming of hostilities work was abandoned when the bore had reached about 400 meters. A small amount of oil had been tapped, and it can now be baled from the old well.

Although there are several strong seeps on the west coast of Cebu, the geologic conditions are not so favorable as are those on Bondoc Peninsula. At Alegria, on the southwestern coast, the seep is located near a fault, and the topography is such that drilling operations would be expensive. Farther north, at the old Smith Bell well near Toledo, the rocks are found in a monoclinial attitude in which there are minor folds. Detailed work in that region has revealed some unfavorable structural features. However, between these two localities, or farther to the north of Toledo, favorable structures might be located.

Mindoro

Two seeps are reported on Mindoro, one near Mangarin, and the other farther back in the foothills to the northeast of this place. I know nothing at first hand of either of these localities and, as far as I know, no published information is available.*

Panay

On Panay Tertiary shales that yield natural gas are found on the eastern flanks of the main cordillera, generally monoclinial ; that is, dipping in one direction, to the east. From work already done in that region it is known that there is at least one well-defined local anticline, known as the Maasin anticline, which might be a favorable location for a test well. However, some comparatively deep artesian wells in that region, which have reached a depth of 527 meters, have shown only small amounts of natural gas and salt water.

Sulu Group

A petroleum seep is reported by observers of the Coast and Geodetic Survey, on Siasi Island, between Jolo and Tawitawi, in the Sulu group. I doubt the genuineness of this seep since there is a great amount of volcanic veneer on those islands. However, this does not preclude the possibility of finding Tertiary sediments beneath.

Chemical and Physical Properties of Philippine Petroleum and Natural Bitumens

Philippine petroleum has a paraffine base and is usually reddish to violet in color. It is clear, and closely resembles oil from

*Geologists of the Richmond Petroleum Company and of the Dutch Shell Company have made examinations here, but the results have not been made public.

Burma and Sumatra. Table 36 gives a fairly complete analysis made by Richmond and other former chemists of the Bureau of Science. Table 36a shows the physical and chemical properties of petroleum from Pidatan, Mindanao. Table 37 gives an analysis of the petroleum residues from Leyte Island. The paraffine content of Philippine petroleum is very high ; a bottle full of oil collected in 1908 from the Toledo well and put, imperfectly sealed, into one of my saddle bags, was found, on unpacking three days later, to contain no oil ; but it was half full of solid paraffine.

TABLE 36a.—Physical and chemical properties of a sample of petroleum from Pidatan, Mindanao.

Specific gravity at 15.6° C ...	...	...	...	0.9297
Distillation :				
Light oils (below 150° C.)	...	...	...	None.
Burning oils (150°—300° C.)	45	per cent	by volume.	
Heavy oils (300°—400° C.)	49.5	per cent	by volume.	
Residue ...	...	...	...	5.5 per cent.
Sediment	...	...	...	Large amount.
Water	...	...	...	Trace.
Base ...	...	...	...	Paraffine.
Main calories, or gross heating value	...	...	...	12,495
Available heating value	...	...	...	11,189
Sulphur	...	...	...	1.56 per cent.

TABLE 37.—Physical properties of natural bitumens from outcrop A and B, Villaba, Leyte.

Property.				
Specific gravity	...	...	...	1.05
Hardness	...	...	...	2.00
Color ...	...	...	...	Jet black.
Streak	...	...	...	Black.
Luster	...	...	...	Brilliant.
Structure	...	...	...	Columnar.
Fracture	...	...	...	Conchoidal.
Intumescs, softens, and flows imperfectly at 150° C.				

Although Mr. Warren D. Smith's article was published in 1924, it undoubtedly was prepared a year or so earlier and could not therefore have included the failure of the Standard Oil Company of California to find oil in commercial quantities. In a statement issued during July 1924 by the Standard Oil Company of California, the reasons for the failure are made clear.

"The Philippines expedition furnishes a striking example of the hazards of the oil industry." states the Standard oil Co. of California in pointing out the sort of conditions referred to. "The search for hidden deposits of petroleum is uncertain—the industry seeks and sometimes finds and sometimes doesn't. In either case the expense is great, requiring resources of vast size. There is compensation, however, for where many wildcat ventures may fail one may succeed with profitable results. Such is the history of oil.

"The Bondoc adventure proves, too, that there is something more to the oil industry than merely the manufacture and sale of petroleum products. Back of the gasoline pump, which is the public's principal point of contact with this vital industry, there is a stupendous activity of which the public is little aware—an activity

TABLE 36.—Physical and Chemical Properties of Philippine Petroleum.

Sample.	Crude oil.		Distillation products.						Residue above 400° C.	Remarks.
	Color by trans- mitted light.	Specific gravity.	Gasoline, to 150° C.		Kerosene, 150° to 300° C.		Heavy oils, 300° to 400° C.			
			Volume	Specific gravity.	Volume.	Specific gravity.	Volume.	Specific gravity.		
Tayabas, Bahay well I.*	Brown to wine red.	0.8325	39	0.770	44.5	0.850	16.5	—	—	Flash point, 0° C. (32° F.); sulphur absent; initial boiling point, 91° C., paraffine, 8.1 per cent.; specific gravity at 15° C.
Well at Toledo, Cebu	Dark brown	0.885	6.2	0.762	42.32	0.832	38.3	0.901	+3.17	Residue above 375° C. specific gravity at 15° C.
Oil seep at Alegria, Cebu	do	—	17.5	—	30.5	—	35	—	—	Residue contained foreign sediment.
Leyte	—	0.923	—	—	—	—	—	—	—	Flash point, 74° C. (166° F.).

*Depth, 40 metres. Sampled by division of mines twenty-four hours after well had been drained.

which leads to the ends of the earth in a quest for new oil. The public hears much of successes, of wells gushing quantities of 'black gold.' Of the failures, of the great financial risks, of the great losses which often must be borne, it knows very little. The world moves on oil, and it is the obligation of those engaged in the industry never to permit the supply to fail. Hence the unceasing search, which nowadays goes far afield. This company to-day has drilling parties in Alaska, Colombia, Ecuador and Argentina, as well as in several states at home, while its geologists are scouring the earth for likely looking territory."

Its Own Survey

The Bondoc venture of the Standard Oil Co. of California was started in 1919, when that company initiated its own geological survey. In 1920 there was a shortage of oil on the Pacific coast (although later there was over-production) and the company decided to drill in the Philippines to insure future supplies. In December, 1920, an expedition sailed from San Francisco for Manila with a thousand tons of material, which included rigs, all machinery, road-building apparatus and even a supply of ropes, also a field hospital equipment. Twenty-five California oil field workers composed the party.

The field operations were in a wild, scarcely inhabited region of southern Luzon, well away from civilization, a tropical land of great heat and torrential rain, an area of typhoons, of fetid humidity and lurking disease. Men and materials were lightered ashore at the mouth of the Pagsanghan River, and the first camp was built several miles from the sea. There were no roads; the area was covered with head-high nipa grass. Bunkhouses were built, California style and design, and after weeks of labor drilling was begun and a well was "spudded in" on March 20, 1921.

"For more than three years the work proceeded steadily," says the company's statement, "but with climatic interruptions. The rains brought floods; the typhoons were destructive. The first hole went to 1,200 feet and was abandoned because of mechanical trouble. No oil. The second was drilled to 3,750 feet. No oil. The third, the final great effort, went down to a depth of 5,120 feet, almost a mile. No oil—and the end.

The company gives its men much credit for their work under hazardous conditions. Disease, particularly malaria and dysentery, was an always present menace, and some became ill, but as a whole health was good, due to proper sanitation. Once the camp was completely isolated for a month—the radio went out of commission, the telephone wire stretching for nine miles between the two camps was blown down, and the road was an impassable mire.

The company concludes its story with the statement: "The failure to find oil at Bondoc does not prove there is no oil in the islands. It means that there is none in the area prospected."

The Problem of Trade Mark Protection in China

"Handbook on the Protection of Trade Marks, Patents, Copyrights and Trade Names in China." By Norwood F. Allman. Shanghai: Kelly & Walsh. November, 1924.

THIS book, as its title suggests, is intended as a practical guide to this most important problem of foreign commerce in China.

As the author states in his preface: "All consular and diplomatic officers in China can testify that there is great confusion and obscurity about the protection of industry and intellectual property in China. . . . The aim of this book is to focus attention on these important subjects, and endeavor to arouse sufficient interest therein to ensure that a practical and satisfactory solution will be found whereby adequate protection will be afforded to trade-marks, trade names, patents, and copyrights."

This aim, we feel, has been well attained, for the clear, concise style of the work makes it of interest and value to the ordinary resident in China who wishes to be well informed, as well as to the legal practitioner who has hitherto had nothing to guide him in dealing with this problem.

Mr. Allman is exceptionally well acquainted with his subject, having formerly served as American Consul and Assessor in the International Mixed Court, deciding there several no table trade-mark cases, as well as conducting the Trade-mark Office of the Consulate-General. He is now engaged in private law practice in Shanghai, and specializing in trade-mark cases. His knowledge of Chinese has enabled him to effect his own translation of the Trade-mark Law, a translation which was made before the official one, and is distinctly clearer and nearer the original than the latter in several details.

This book is divided into four chapters, each relating to one of the subjects mentioned in the title of the book. Most attention is, of course, given to trade-marks, as that is the only subject in which the Chinese Government has made definite legislation available for foreigners. The value of the book is much enhanced by the diplomatic correspondence included, and a good index also adds much to its scholarliness.

The timeliness of such a work cannot be over-emphasized, as anyone reading Mr. Allman's description of the provisional registration hitherto in use will perceive. The opposition of the diplomatic body to the new Trade-mark Law has caused the owners of many trade-marks to become unduly confused as to the best procedure to adopt, and this work will certainly be of value in clarifying the situation for them.

There is no attempt at criticism or arbitrary statements in regard to the legal effect of the situation, but a brief and interesting history of how the present situation arose, and practical suggestions for meeting it. The outline for registration procedure is most helpful to firms resident abroad, and it is to be hoped, in the interests of foreign trade, that this book will fall into the hands of such. It cannot fail to be of use and interest to anyone having connection with China.

Large Turbine Furnace Contracts

The Federated Malay States, India, and Burmah, as well as New Zealand, South Africa, Canada, and Chile, have placed large orders for turbine furnaces with the Turbine Furnace Co., Ltd., of London. The furnaces are for a variety of different kinds of work. They are to be installed in many of the Indian textile mills, as well as in some of the mines and electrical stations; in locomotives in the Burmah service, and in tin mines in the Federated Malay States. In Chile they are in use in the navy and in privately-owned steamers.

The boilers are so fitted as to include all the regular recognized types, both vertical and horizontal. In Great Britain the number of these furnaces installed of late has been very large and they are also so much in favor in Continental Europe that it has been found necessary to form an independent company to carry out the orders. This is located in Brussels, Belgium, and is the headquarters for the whole of the Continent.

New Motor Vessel for Far Eastern Trade

The new steel screw motor vessel *Silveray* has just been launched by Messrs. Joseph L. Thompson & Sons, Ltd., from the North Sands Shipyard, Sunderland. She has been specially built for the Way Shipping Company, Ltd. (Messrs. Stanley & John Thompson, Ltd., London, Managers), and is intended for a special line between America and the Far East.

The dimensions of the vessel are 412-ft. long by 57-ft. beam, and 30-ft. 5-in. depth to the shelter deck. She has been constructed to Lloyd's highest class on the latest single deck rules, with open shelter deck. She is designed to carry about 8,000 tons on a moderate draught of water. The engines, which are being supplied by Messrs. William Doxford & Sons, Ltd., Pallion, are of the Doxford opposed piston type, with three cylinders, 580 bore, 1,160 stroke, and giving 2,650 horsepower at 90 revolutions. This is estimated to drive the vessel a good eleven knots. The auxiliary machinery will be driven electrically, and the equipment has been supplied by the Sunderland Forge & Engineering Company, Ltd. The christening ceremony was performed by Mrs. Robert Thompson, of Over Dinsdale Hall, near Darlington.

Petroleum in West China

THE exploration of the petroleum fields in western China, in Shansi, Shensi, Szechuen, Kansu and Sinkiang naturally attracts the attention of the western nations who are constantly seeking additional supplies of this all-important mineral. Thus far the Chinese government has done nothing either to find oil or to exploit the wells found. There was at one time considerable talk of the founding a Petroleum Bureau in the government, but nothing has come of it. Meanwhile, the Russians are active in Sinkiang and Kansu which border on Russian territory. Chinese efforts in Shansi and Shensi are extremely rudimentary and the developments thus far are of little importance.

Oil in Shansi

Shansi provincial authorities have recently outlined a program for the development of the oil refining industry in the province on a large scale. The program covers a period of ten years, during which a yearly appropriation of \$300,000 is to be made from the provincial treasury for the undertaking. According to the estimate, in ten years the Shansi authorities will be able to establish 44 oil refineries with funds from both the yearly appropriations and the profits accruing from the industry. In the opinion of the Shansi authorities, the province ought to be able to produce enough oil not only for the local market but also for other provinces and even for foreign countries; yet at present Shansi imports about 14,000 tons of kerosene from foreign countries yearly at a total valuation of over \$3,000,000. Shansi authorities plan to obtain oil from the extensive shale deposits and their present opinion is that an oil refinery could be established profitably in any locality in the province, if labor and means of transportation were available.

According to the prospectus issued by the Shansi authorities, each refinery is to consist of one distillation plant, one refining plant and a machine repairing shop. Attached to these, there will be a plant for collecting and manufacturing such by-products as carbolic acid and so forth. The total initial outlay for establishing a unit refinery plant is estimated at approximately \$200,000, consisting of the following items:

(a) Machinery for the distillation and refining plants and the machine repairing shop and building for the establishment (not including the land) ..	\$95,000
(b) Machinery for the byproducts manufacturing plant ..	31,237
(c) Building for the business department, etc. ..	15,000
(d) Cost of land (about 50 mow)	1,500
(e) Purchase of mining area (10 square li)	30,000
(f) Cost of transportation and installation of machinery	20,000

Total \$192,737

Each refinery is to be capable of turning out six tons of crude oil a day, or 1,800 tons a year, counting 300 working days. From this quantity, 20 per cent or 360 tons of kerosene and an equal percentage of gasoline could be obtained it is said. In addition, there would be 20 per cent. or 360 tons of lubricating oil. The remaining 40 per cent. of coal tar could also be utilised for making different kinds of by-products. The items of the yearly net receipts from the sale of the output of each refinery, after deducting the sales and transportation expenses, are estimated as follows:

(a) 360 tons of kerosene oil (\$150 per ton, net.) ..	\$54,000
(b) 360 tons of gasoline (\$230 per ton, net.) ..	82,800
(c) 360 tons of lubricating oil (\$134 per ton, net) ..	48,240
(d) 720 tons of coal tar (\$30 per ton, net)	21,600
(e) 7,200 tons of coke (\$0.50 per ton, net)	3,600

Total \$210,240

The yearly running expenses of a refinery are estimated at \$86,595 to which must be added two yearly appropriations of \$20,000 for repayment of one-tenth of the initial outlay (which is to be repaid in ten yearly instalments) and \$33,645 against plant depreciation and other incidental expenses. After deducting these items from the business receipts of \$210,240, the net profit would be \$70,000, details being shown by the following figures:—

(a) 60 tons of bituminous coal per diem or 18,000 tons per annum of 300 working days, at an estimated cost of \$1 a ton.. ..	\$18,000
(b) Wages for operatives per annum (365 days) ..	37,595
(c) Cost of making oil cases and tins	13,500
(d) Salaries for the managing department	12,500
(e) For losses and repairs	5,000
(f) Appropriation for repayment of initial outlays..	20,000
(g) Appropriation against plant depreciation and other incidental expenses	33,645

Total \$140,240
Net profit \$70,000

Thus in ten years the number of oil refineries would be increased to 44, the scheme being explained in detail as follows. If the Shansi provincial treasury appropriates a yearly sum of \$300,000 for this undertaking for 10 years, during the first year, one oil refinery at a round figure of \$200,000 would be established, leaving a surplus of \$100,000 to be carried over to the next year for further expansion of the undertaking. In the second year \$400,000 (\$300,000 being regular yearly appropriation and \$100,000, surplus carried forward from the previous year) would be available for expansion hence in the second year, two refineries could be established. By the end of the second year, a net profit of \$70,000 made by the refinery established during the first year would be available for the expansion of the scheme, and this sum would be carried over to the third year for establishing more oil refineries. In this manner the number of refineries would increase to 44 in the tenth year. Detailed figures are shown in the following table:—

Year	Funds Available for Expansion, including yearly appropriations, surplus and profits	Number of Refineries to be established	Funds expended for establishing new refineries	Net Profits	Surplus to be carried over to next year	Profits to be carried over to next year
1st Year	\$ 300,000	1	\$ 200,000	nil.	\$ 100,000	nil.
2nd "	400,000	2	400,000	\$ 70,000	nil.	\$ 70,000
3rd "	370,000	1	200,000	210,000	170,000	210,000
4th "	680,000	3	600,000	280,000	80,000	280,000
5th "	660,000	3	600,000	490,000	60,000	490,000
6th "	850,000	4	800,000	700,000	50,000	700,000
7th "	1,050,000	5	1,000,000	980,000	50,000	980,000
8th "	1,330,000	6	1,200,000	1,330,000	130,000	1,330,000
9th "	1,760,000	8	1,600,000	1,750,000	160,000	1,750,000
10th "	2,210,000	11	2,200,000	2,310,000	10,000	2,310,000

By the end of the 10th year, 44 oil refineries would be operating, leaving a surplus of \$10,000 and a net profit of \$2,310,000, according to these plans.

Oil in Northern Shensi

Mr. Brouyard, chief engineer of the Chengting-Taiyuan Railway, in making a survey for a proposed line from Taiyuan to Sianfu, has explored the petroliferous region of Yen-an, Northern Shensi. The seepages are east of Yen-an along the Fuho River and in the ravines above and below Yenchang. At Likiawa, there are two seepages in the river bed, near the banks. In front of Kiaokiachekow, on the right bank of the Fuho, there is another seepage, but the oil is lost by permeation through the surrounding rock. Below Yenchang, on the left bank of the Fuho, there is a plentiful seepage. In a ravine west of Yenchang, oil is also found oozing out from fissures in sandstone. Three kilometers from Hukiachwang in a village east of Yenchang, there is the heaviest seepage, from cracks in the sandstone. The water in the ravine about the village, locally known as "Petroleum Ravine," is undrinkable, on account of its oil content. The soil in the vicinity must also have been soaked with petroleum, judging by the burning appearance of the plants. In the ravine of Lochiameng, 10 kilometers east of Yenchang, only a small seepage is located.

An oil plant has been established in Yenchang, outside the West Gate. It is equipped with a 12 h.p. engine. A well has been sunk to a depth of 260 feet connected with two pipes, 75 millimeters in diameter. Upon being pumped, only water is drawn up during

the first two days, water mingled with more and more oil during the third and the fourth day, and oil alone during the fifth day. After two days pumping the engine is cleaned before work can be resumed. The plant has been operated for about a year, during which 1,550 cattles of refined oil have been put on the market with 1,000 cattles of petroleum ether, and 3,000 cattles of vaseline and paraffine. Refined petroleum is sold retail on the spot at 12 cash a catty. Practically the whole production is sent to Sian, only 35 cattles being consumed on the local market. The cost of transportation has been increased during recent years. In 1908, a donkey bearing a load of 230 cattles for a distance of 80 li per day cost only 700 cash. But the cost is now much higher, and has prohibited any further growth of the industry.

The oil deposits at Yenchang, in northern Shensi, cover a total area of over 6,000,000 square feet, according to the estimate of a Japanese expert. Yenchang, a hsien district, formerly under the prefecture of Yen-an, Shensi province, is situated on the right bank of the Yellow River. The oil field extends from the city to the north-west and is bisected by the Yen River, a tributary to the Yellow River. The larger portion is found on the northern bank of the Yen River. Oil works in these regions date back to the Ming dynasty (1368-1661), but only a limited quantity of impure oil was obtained formerly, as primitive methods were used. The poor yield apparently did not encourage the local capitalists, and the greater part of the field has been left undisturbed up to the present time. Attempts were made by a German and a Japanese firm to work the oil fields some thirty years ago, but little was accomplished in either case. Operations under Chinese auspices were resumed about twenty years ago after the discovery of an oil well outside the east gate of the City, which yielded large quantities of crude oil. In 1906 the Yenchang Petroleum Company, a private and Government joint enterprise organised by the Shensi officials and members of the local gentry, was formed to work the oil wells under the direction of some Japanese experts. In the winter of the following year, drilling to an average depth of about 250 feet had to be carried out before the oil bearing sand was reached. The crude oil at first was found to contain a rather high percentage of brine. The daily output averaged 8,000 cattles of crude oil, from which about 2,500 cattles of refined oil were obtained. Several years later two or three new oil wells were drilled.

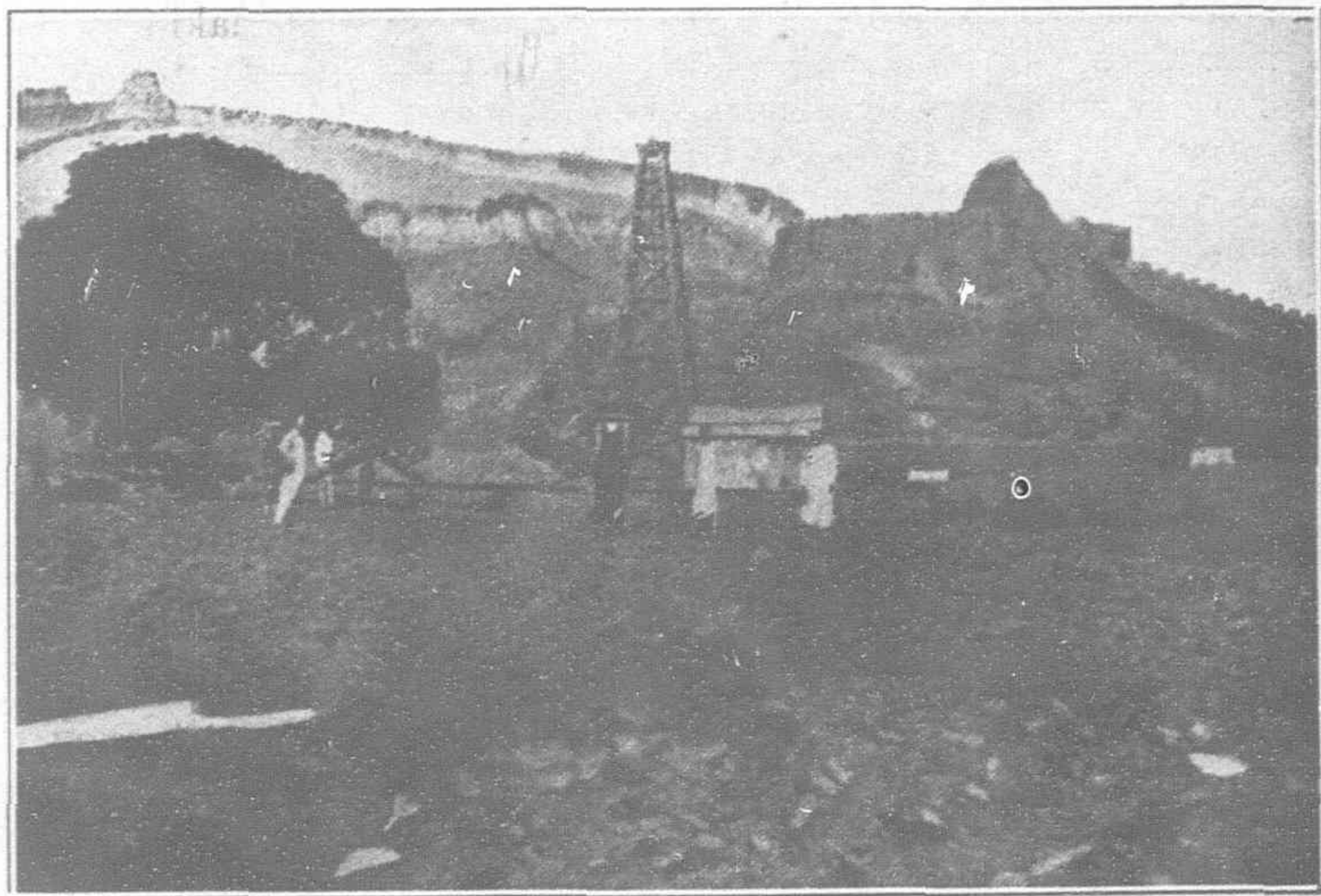
The company experienced a chequered career during and immediately after the Revolution of 1911. Operations were suspended during the first two years of the Republican regime, but were resumed in 1914. Amer-

ican interests representing the Standard Oil Company were admitted into the enterprise, but the joint Sino-American undertaking did not prove a success because of the poor prospects of the wells. The company is now a purely Government financed enterprise.

The geological position of the Yenchang oil deposits bears a resemblance to those at Fushun and Kiating, in Szechuen province, both being of mesozoic formation. The crude oil obtained from the Yenchang wells is of dark brown color and, after fractional distillation, is found to contain: benzine, 16.5 per cent.; kerosene, 62 per cent.; heavy oil, 10 per cent.; paraffin, 2 per cent.; residue, 9.5 per cent.

The company is rather poorly equipped. Sets of modern drilling machinery ordered from abroad during the first few years of the Republic are now left rusting at Ichun, Shensi province, and it is reported that certain component parts of the machinery have been removed for other uses by the local militarists. Even the number of pumping outfits is not sufficient to work the oil wells, from which oil is sometimes obtained by means of water pails. Poor equipment has been responsible for the present limited output.

The company's head office is at Yenchang with a sales department at Nanyuanmen Sian, Shensi provincial capital. The most important product of the company is kerosene, which is sold under the "Yenchang" brand. Only a very limited quantity is consumed on the local market, the bulk being sold at Sian. High transportation cost, however, prevents the oil from seeking a market further than Sian. Among the company's by-products are candles made of paraffin, benzene, lubricating oil, gasoline, heavy oil and rhigolene, the last named being for surgical use. The candles are sold under two brands, the "Swan and Pagoda" and the "Pheasant;" benzine, under the "Horse" brand and lubricating oil, under the "Double Gun" brand.



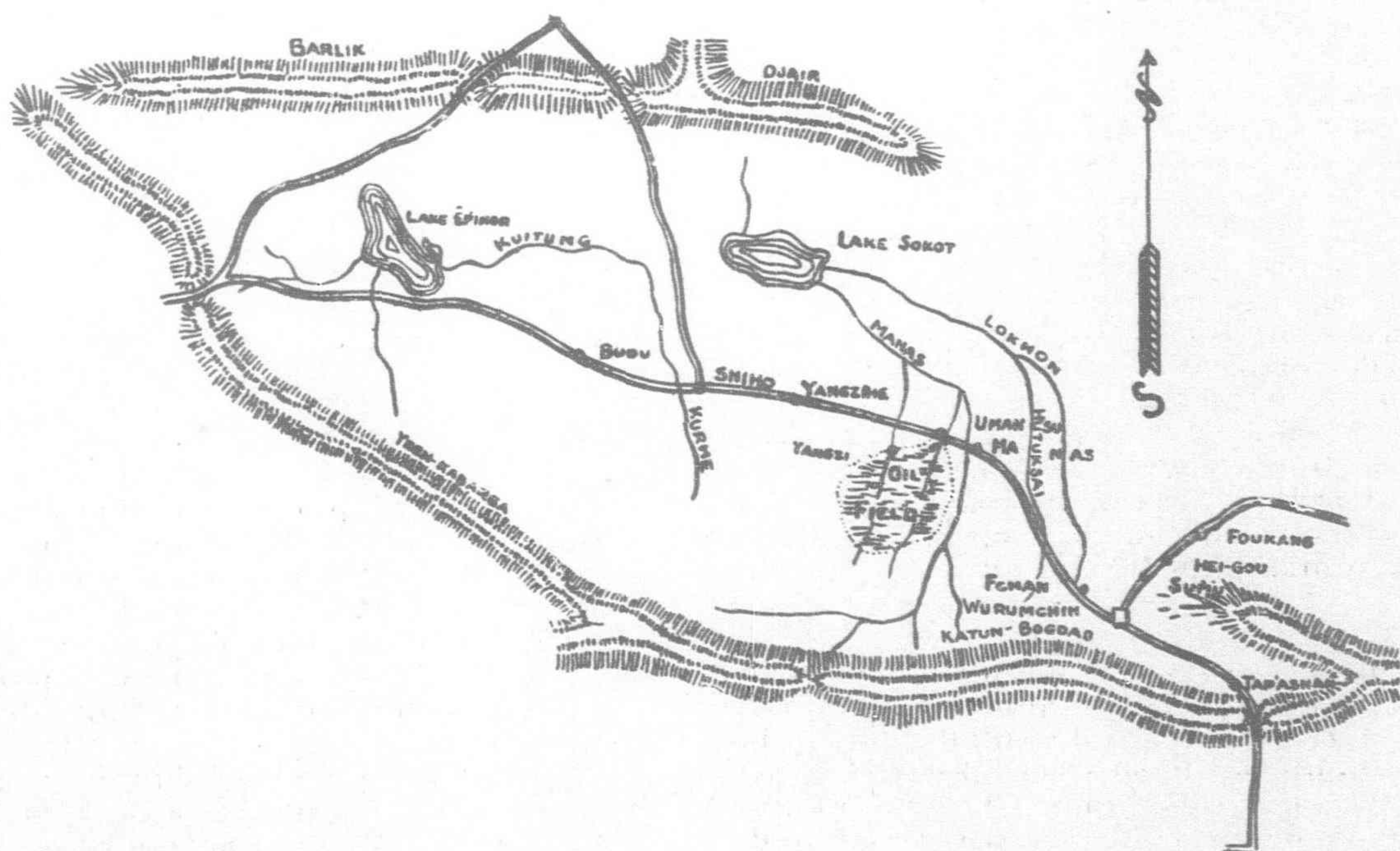
Oil Well at Yenchang

Oil in Sinkiang

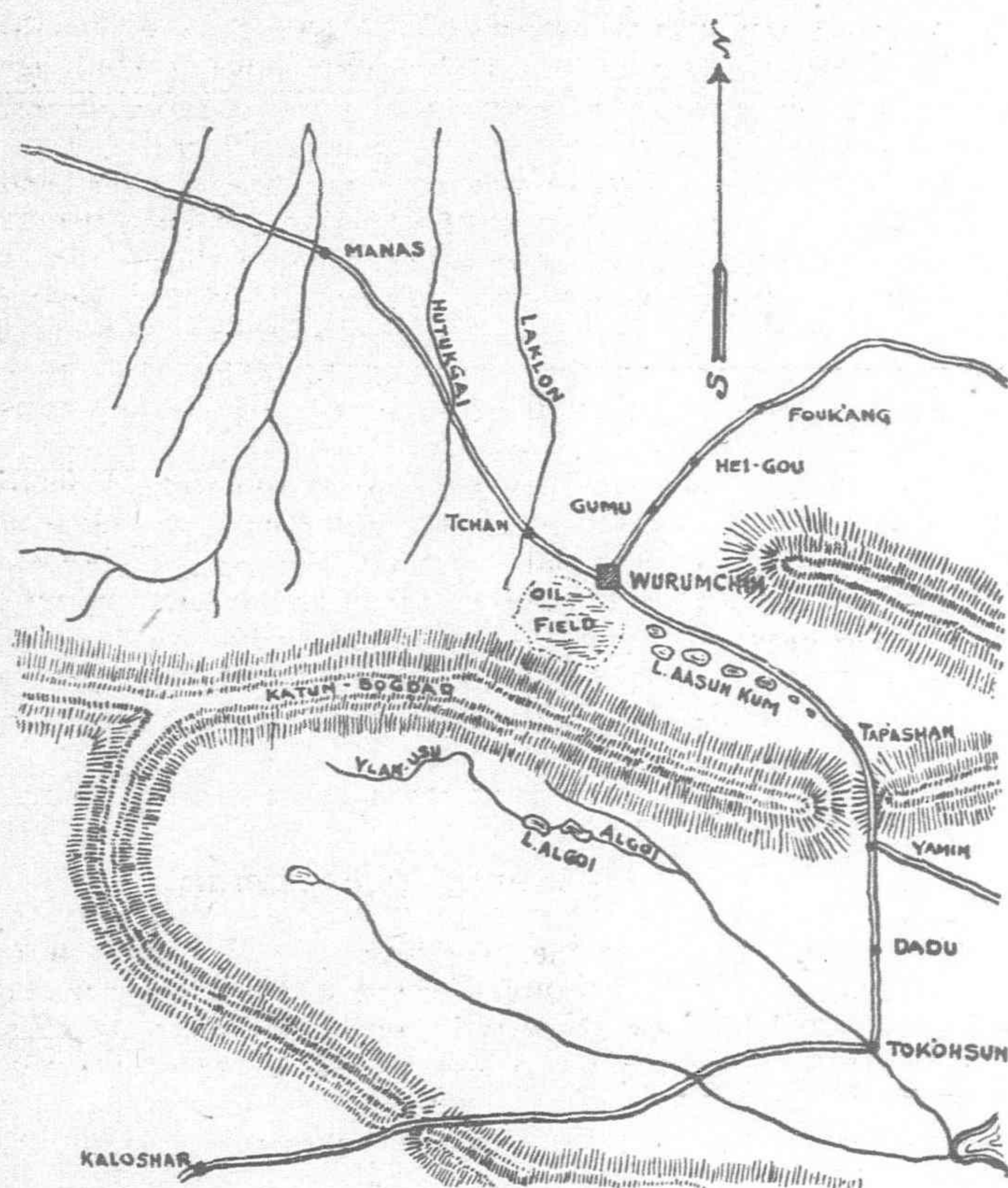
The following notes are taken from "Mongolia and Western China" by W. Karamisheff.

Petroleum can be found in the province of Sinkiang in two places. The first field is within 30 kilometers from the river Manas on an area bordered on the south by the Yren-Kabargo mountains, on the north by the mountains Barlik and Djair.

The oil bearing field is situated to the south of the road that leads from Urumchi to Djarkent. The field is vast and is situated between the river Hargos on the west, the river Manas on the east, the mountain range Uren-Kabarg to the south and the Shiho-Manas to the north.



The Scheme of the First Oil-field near the River Mauas, Sinkiang Province



The Scheme of Second Oil Field near Urumchi, Sinkiang Province

The number of seepages is considerable; there are supposed to be about 78. We shall discuss only those groups which have been more or less investigated and about which detailed information exists.

In the indicated area, about 35 kilometers from the river Manas, lies the first group consisting of seven seepages that are situated close to one another and form a rough circle. Each of them is in the shape of a small hill, about 14 feet high, the breadth of which is considerably larger than its height. Through the center of this hill passes a vertical channel out of which the petroleum is constantly oozing to the surface.

In the opinion of Russian mining engineers those hillocks were formed in the following way: The petroleum which spread over the ground was covered with sand, by strong winds, the ground in this region being sandy. Mingling with the sand the petroleum gradually formed a crust which, during a long period, grew to the size of a hill. Due to contact with the air, the volatile parts of the petroleum evaporated, the heavy substances remaining. Within 10 kilometres from this group one petroleum seepage is found and a few kilometres further there are 15 more.

All of them are of the same shape and origin as the preceding seven. None of these seepages has ever been properly worked. A few years ago a mixed Chinese-Mohammedan-Russian Company was founded, with which became incorporated the South Siberian Association at Semipalatinsk, a rich merchant Ismailbaieff, at Chugoutchak, Risseff and others. The concession for the working of this oil bearing area was obtained by the son of the governor of Chugoutchak, Hsueh, from the Tschun of Urumchi; but the political events in Russia on one hand, and the dismissal of the governor of Chugoutchak, on the other, prevented the company from developing their concession and the oil wells remained almost intact. There now exists a very primitive way of working these wells that cannot be called exploitation. The local inhabitants gather the petroleum on the surface and sell it in crude form, as a lubricating substance for cart wheels.

Two samples of this petroleum were sent in 1919 by the South Siberian Association to the laboratory of the Tomsk university for analysing purposes. The analysis was made by Professor Povarnin and gave the following results:

The Analysis

1. *The physical properties.* Outwardly both samples represent a thick fluid of black-green-brownish color, resembling mazoot crude petroleum.

The specific gravity at 15° C.

Sample No. 1	0.924
" " 2	0.926

The constituents were defined by means of a double process. The first process: Fractional distillation at 200°, 300-350° A residue was obtained.

Second process. Distillation of the first two fractions at 150°, 150-270°, 270-300°, 300-350°. A residue was obtained.

At the same time the boiling point of the fractions that boil at a temperature over 300° fell under normal and the output of illuminating oils increased.

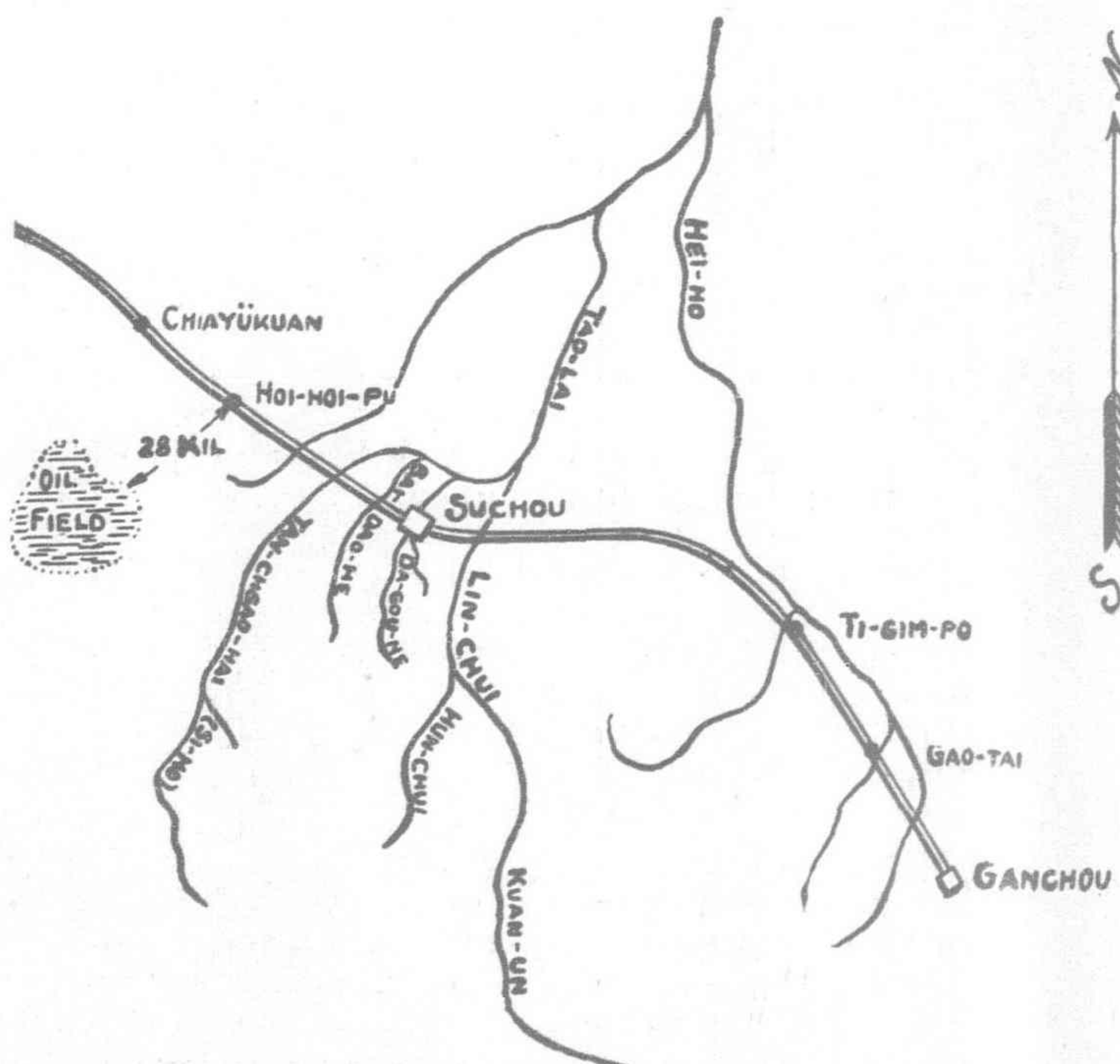
The fractional distillation up to 300° was made with a powerful dephlegmator. Besides, another fractional distillation was made parallelly without superheating, which for sample No. 2, yielded 10 per cent. less of light oils.

Sample No. 1		
Benzene (up to 150°)	2.9%	
Kerosene (from 150 to 270°)	36.0%	48.5%
Pyronaphtha (from 270 to 300°)	12.5%	
Total Kerosene	48.5%	
Light Oleonaphtha (from 300 to 350°)	15.9%	48.6%
Heavy " (above 350°)	12.0%	
Tar	20.7%	
Total Mazoot	48.6%	

Sample No. 2		
Benzene (up to 150°)	6.0%	
Kerosene (from 150 to 270°)	33.6%	45.8%
Pyronaphtha (from 270 to 300°)	12.2%	
Total kerosene	45.8%	
Light oleonaphtha (from 300 to 350°)	13.7%	
Heavy " (above 350°)	11.1%	
Tar	9.5%	23.4%
Coke and loss	13.9%	
Total Mazoot	48.2%	

The quantity of these liquid samples that boil at a temperature below 80 per cent. does not exceed $\frac{1}{2}$ —1 per cent. It was difficult to fix this amount precisely, owing to the small quantity of samples. The figure of the percentage of benzene might also be inexact, due to the fact that the water contained in the thick liquid had been weighed simultaneously. It would be more accurate to define in sample No. 2, the quantity of benzene less than 6 per cent. and of the kerosene more than 33.6 per cent.

The fractions of distillation were purified with sulphuric acid, water, sodium hydroxide and again with water. All fractions, except the one boiling at a temperature above 350 per cent. were colorless. The fraction above 350° was of greenish, yellowish color. The specific gravity of the unfractionated kerosene was 0.815. Tar



The Scheme of Third Oil Field near Suchow, Kausu Province

represents a thick sticky substance, insoluble in alcohol and soluble in ether, when it gives a sediment of coal. The crude fractions being exposed to the air soon become brown. The fractions purified with sulphuric acid being poured into water produced sulpho-acids easily emulsifying in water, and emulsifying oils. The sulpho-acids of the heaviest fraction, when poured into water, produce a green-brownish powder, heavier than water. This powder was not subject to closer examination.

These general properties entitle one to affirm that :

- (1) Both samples are very much alike as regards their constitution.
- (2) Both are of the lowest kind, poor in oils, boiling at a low temperature, but being superior even to the Baku petroleum as regards the percentage of kerosene (the petroleum of Baku containing up to 55 per cent. of mazoot).
- (3) The quantity of unfractioned kerosene in them can be brought to 45-58 per cent., and of lubricating oils to 25-28 per cent., while there will be benzene not less than 3 per cent.
- (4) If suitable conditions of transportation be established, these fields, being very rich in oil with relatively favorable geological conditions, their exploitation is worth while.

The Oil Field at Urumchi

The second oil-field is situated to the southwest of Urumchi, the capital of Sinkiang, in a hilly country on the slopes of the Tien-Shan range, within about 30 kilometres from that town.

There are two petroleum and water springs lying close to a lake, the whole valley of which is strongly saturated with petroleum. In this region one sees a great number of spots that are distinctly visible on the secondary alluvial deposits and the sand stone. The characteristic smell of these spots indicates at once that there is petroleum. Besides, petroleum and water, these two springs emit also lighting gas that ignites when a burning match is approached. These springs are not worked and it is therefore impossible to say how much naphtha they could produce. In the opinion of Russian mining engineers both these springs might yield only a very small quantity of petroleum. It seems more profitable to extract petroleum from the clay taken from the surroundings of these springs. The clay is sandy. Within five kilometres of the valley a primitive factory has been established with three vertical boilers. The clay is put into these boilers and heated by direct fire while superheated steam, which extracts the oil, is passed through the boilers. Such a primitive method of producing petroleum results in a miniature production.

The petroleum thus obtained is submitted to fractional distillation, the daily yield not exceeding 100 lbs. of kerosene. This quantity is about a half of the quantity of petroleum produced daily. The kerosene is of a yellowish color and produces considerable soot when being burned. This can be explained by the fact that there is no dephlegmator at the factory and the kerosene is not refined with sulphuric acid, water, sodium hydroxide and again with water.

Aspects of Sinkiang Oil-fields

Such are the oil-fields of Sinkiang, the proper working of which might be of great importance not only for that province but for the whole of China. Our description of these resources has been taken from materials of Russian industrialists who have, naturally, only noted those fields which they have come across by pure chance. We do not know whether regularly organised geological prospecting might not discover new oil-fields, but nevertheless, considering the quoted analysis, those we have described most undoubtedly ought to be of great industrial interest.

Some light has already been thrown in the press on the oil-fields in Sinkiang.

Kansu Oil-fields; A Revelation

But, we have not yet met with any description of oil-fields in the province of Kansu and we believe that what we have to say on this subject will be a revelation to most of our readers. Yet the oil-fields of Kansu, as regards their size, reserves and quality, of oil are not inferior to those of Sinkiang. This oil-field is situated in a hilly country within 100 kilometres to the southwest of the town of Suchow and about as many kilometres to the north of the mountain

range Yi-shan. Its general aspect is as follows : In the valley of a rivulet on its right bank, in gravelled and sandy ground, seven holes are dug out, and on the eastern wall of each, petroleum oozes. The holes are in a straight line, are parallel to the sides of the valley and about 3½-ft. deep. The distance between them is a few yards.

The valley of the rivulet is more like a ravine ; its breadth is 280-ft. and its depth 350-ft. The right bank of this rivulet has sandy and gravelly deposits, while further down the river there are layers of sand stone and clay slate that have a declivity towards the south forming an angle of 50 per cent. These layers have crevices filled with thin slices of tar-solidified naphtha—with a characteristic naphtha smell.

To the south of the seventh hole the sandy and gravelly deposits of the right bank of the rivulet in the ravine equally change into layers of sand-stone and clay slate sloping to the east. These layers have also crevices with thin slices of tar. This oil-field is not exploited. The local inhabitants gather the petroleum for lubricating purposes. About 185-lbs. of naphtha are extracted daily from each hole. This field is also of great interest from the industrial point of view.

Colossal Electrical Equipment

The largest steam turbine generator unit ever built will be constructed by the Westinghouse Electric & Manufacturing Company East Pittsburgh, Pa. U.S.A. and placed in service in the Hudson Avenue Station of the Brooklyn Edison Company, New York U.S.A.

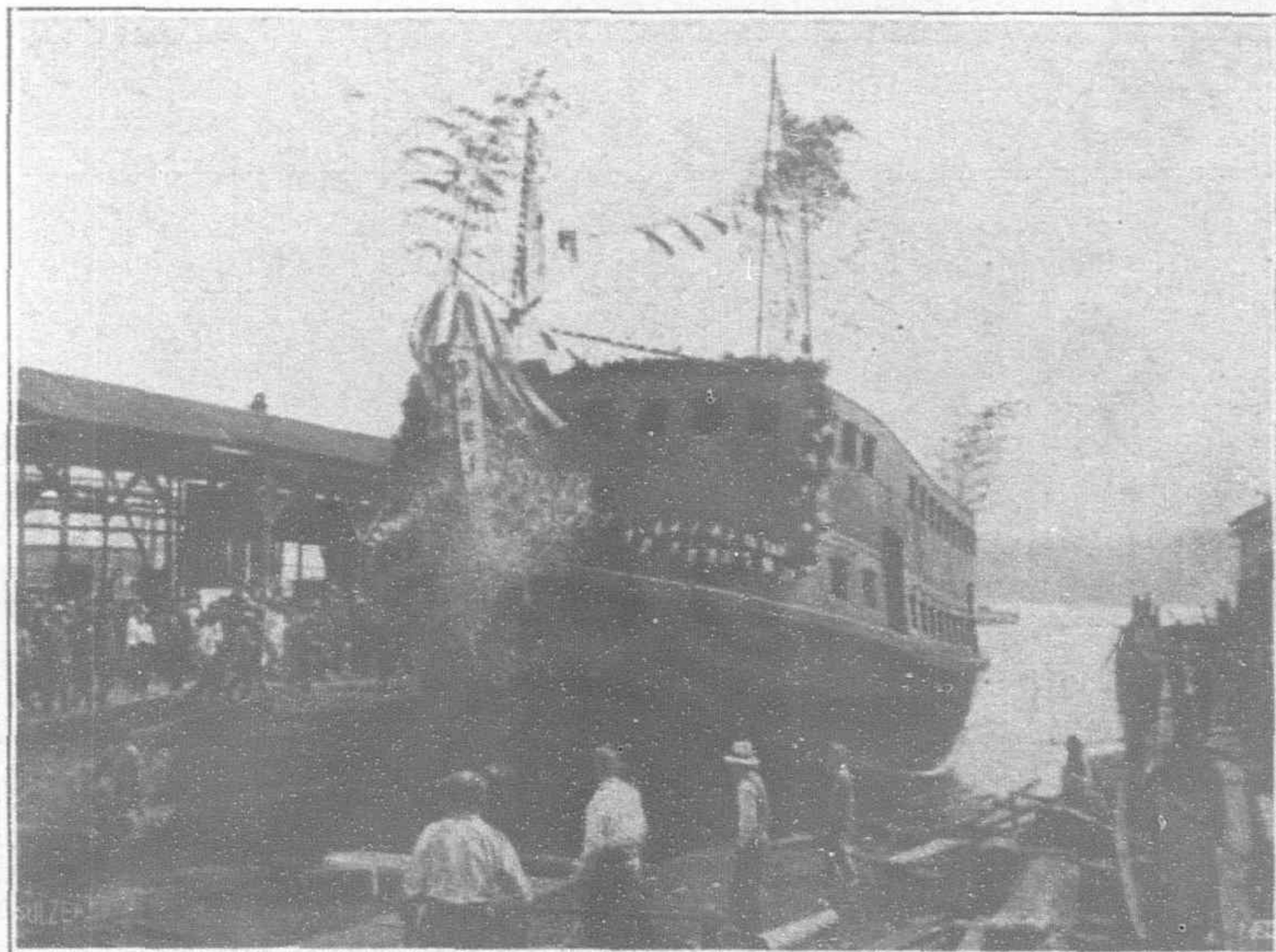
This huge piece of electrical machinery will have a capacity of 80,000 kilowatts and will develop approximately 110,000 horse power.

The placing of this order by the Brooklyn Edison Company will make the third Westinghouse Generating unit to be placed in service by this company. The other two are both 50,000 kw. units.

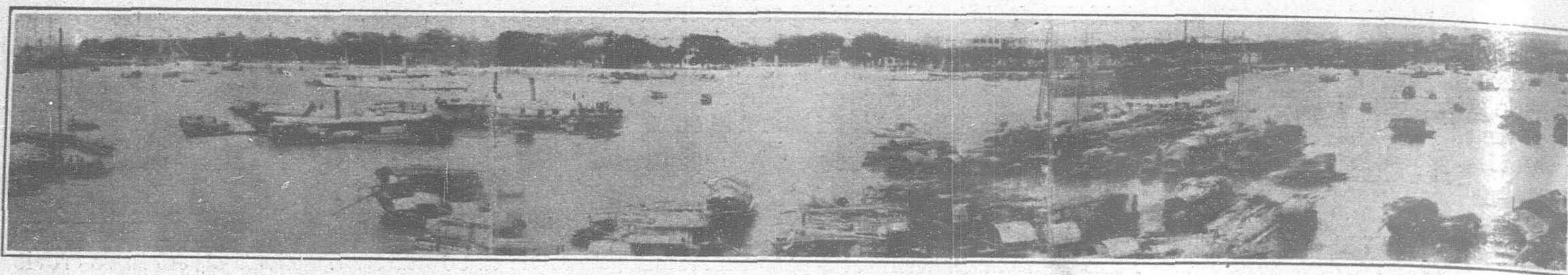
The complete unit will weigh nearly two million pounds. Its design will include all the latest improvements that the engineers of the Westinghouse Company have perfected upon this type of equipment.

Japanese Boat Equipped with Sulzer Airless Injection Diesel Engine

The Military Traffic Office at Ujina, Japan, has recently put a new passenger boat into service. This boat, built in the Ujina Dockyards, has the upper structure in aluminium, and is propelled by two 100-b.h.p. Sulzer airless injection Diesel engines running at 300 revs. per min. and giving the boat a speed of about 10 knots. For going astern, reversing gear is provided for altering the direction of rotation of the propellers. A third Sulzer airless injection engine, a single-cylinder engine developing 20 b.h.p., drives a 10 k.w. dynamo to supply electricity for lighting the boat.



Japanese Boat propelled by two 100-B.H.P. Sulzer Airless Injection Diesel Engines



THE SHAMEEN

Lighting the Bund of Shameen

GRAHAM KEARNEY, Manager, Andersen, Meyer & Company, Canton

I AM enclosing a set of photographs illustrating the lighting which we recently installed on the Shameen Bund and which may be of interest to you and to readers of the *Digest*.

Shameen is a small island, a part of Canton about five-eighths of a mile long by about a quarter of a mile across, and is leased jointly by the British and French governments. The British occupy approximately two-thirds of the island, and the French approximately one-third, each having its own separate municipal council, police force, etc.

These ten lighting standards were purchased by the British Municipal Council and are installed on the southern side of their end of the island. They are so pleased with the effect that they are now considering extending these fixtures over the rest of the island,



The New Lighting Unit and the Old

and the French Municipal Council are also contemplating a similar change.

The old fixture was originally a kerosene standard, a small kerosene lantern, we understand, having been hung in the circle which was then the top of the pole. I have been unable to find out how long they have been there, but the oldest inhabitant of Shameen, who came here way back in the 70's, tells me they have been there as long as he can remember. You will note that one of the pictures shows an old standard still in the foreground—this photograph having been taken before the new installation was entirely complete.

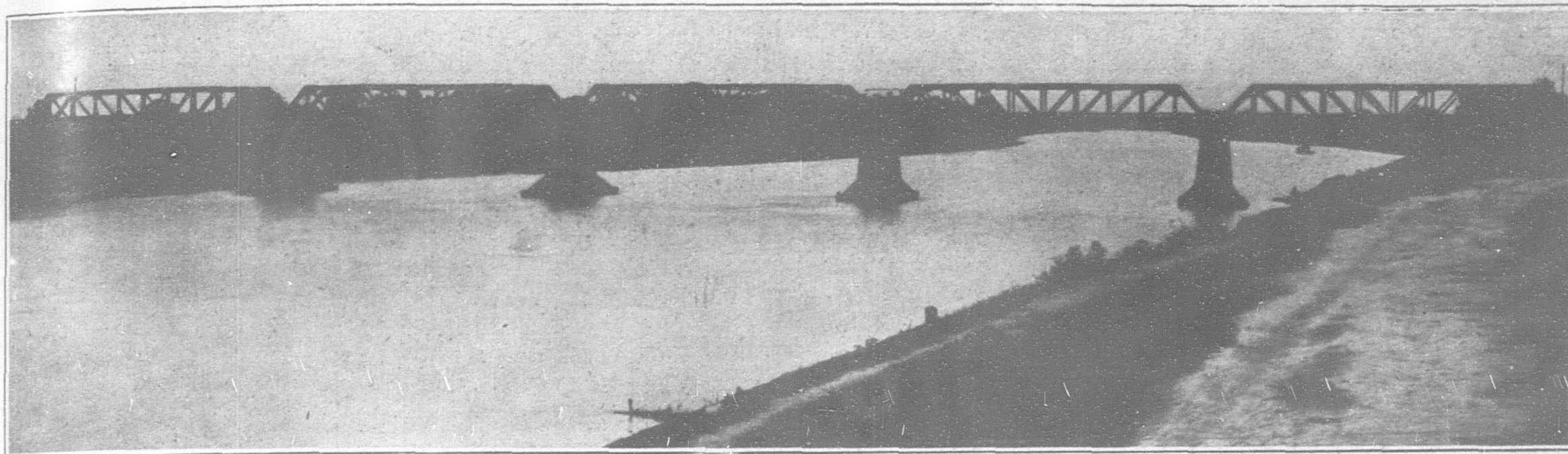
Quite a little interest has been created locally by the fact that the Union Metal lamp standards bear the name plate "Canton, Ohio," thus forming a direct link between two cities of the same name in China and the United States.



General View of the Bund



Starting a Trench for the Underground Cable



Bridge over the Grand Canal 5 spans of 100-ft. each

The Lunghai Railway Eastern Extension

By E. R. Hondelink, Engineer-in-Chief, Lunghai Railway, Eastern Division

ON June 11, 1925 the last rail was laid, which completed the track of the railway from Hsuehowfu, the junction on the Tientsin-Pukow railway, to the sea the eastern section of the Lunghai Railway.

The construction of this section was undertaken by the Netherlands Syndicate for China in 1921. Before that year *The Compagnie Générale des Chemins de Fer et des Tramways en Chine*, a Belgian company had constructed since 1912 the sections of the Lunghai Railway, which joined in the east Kaifeng, the existing terminus of the Pienlo Railway with Hsuehowfu, and in the west Loyang, the other terminus of the Pienlo line with the hinterland beyond as far as Kawniyintang.

The work on the eastern section was started early in 1921 at the Hsuehowfu end; in February 1923 the first section, Hsuehowfu—Yunho, 73 Kilometers (45 miles) was opened for traffic.

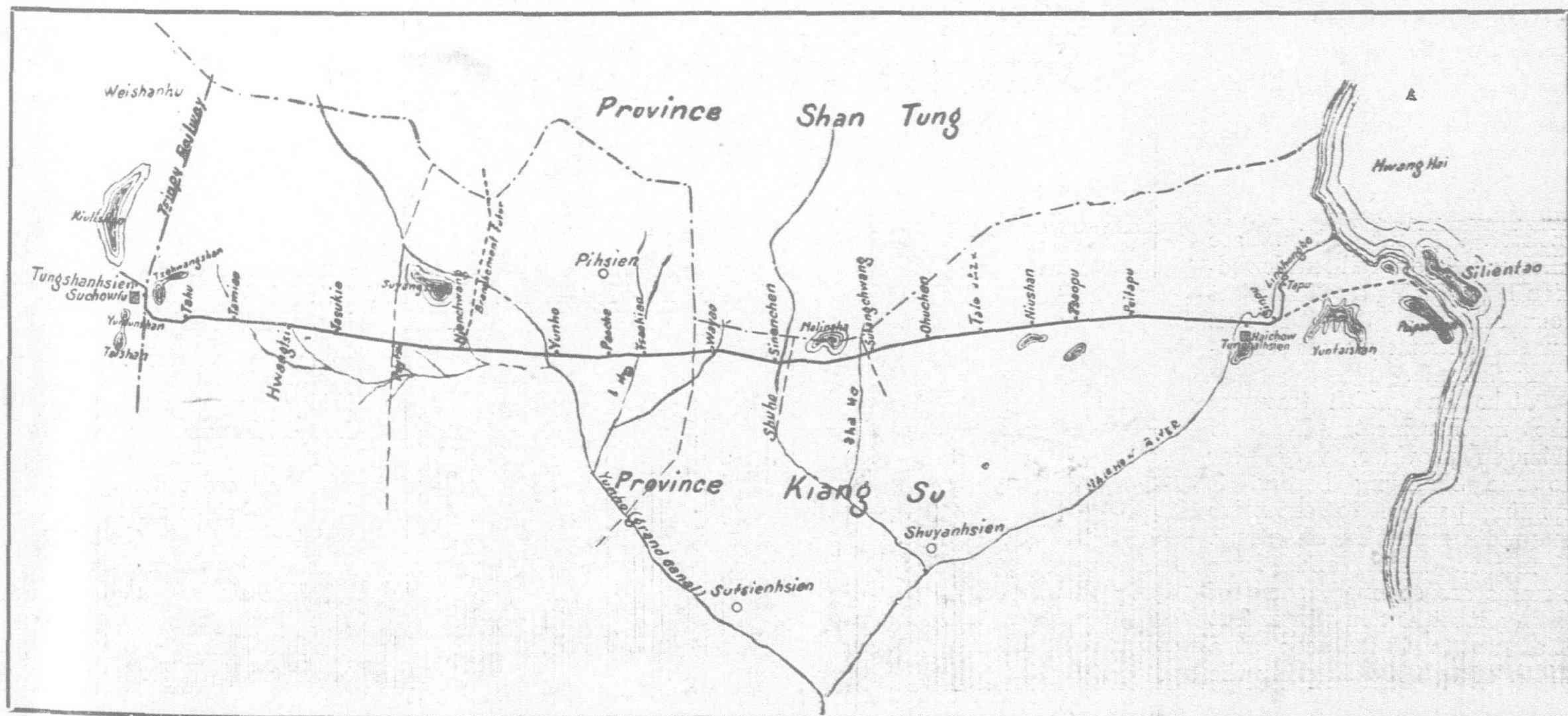
At Yunho the Grand Canal is joined and a small riverdock has been constructed there for the trans-shipping of goods.

The line from Hsuehowfu is following the northern embankment along the old Yellow River for about 8 miles till where the river turns southeastwards; from this point on the line is laid practically due-East. The country is flat, yet numerous bridges had to be built to provide enough flood-openings for the water that nearly

every summer rain season covers the country. When reaching the Grand Canal the railway is laid on a 10-ft. embankment fortified by stone-defenses. The early construction period was considerably hampered by the exceptionally high floods of the 1921 summer.

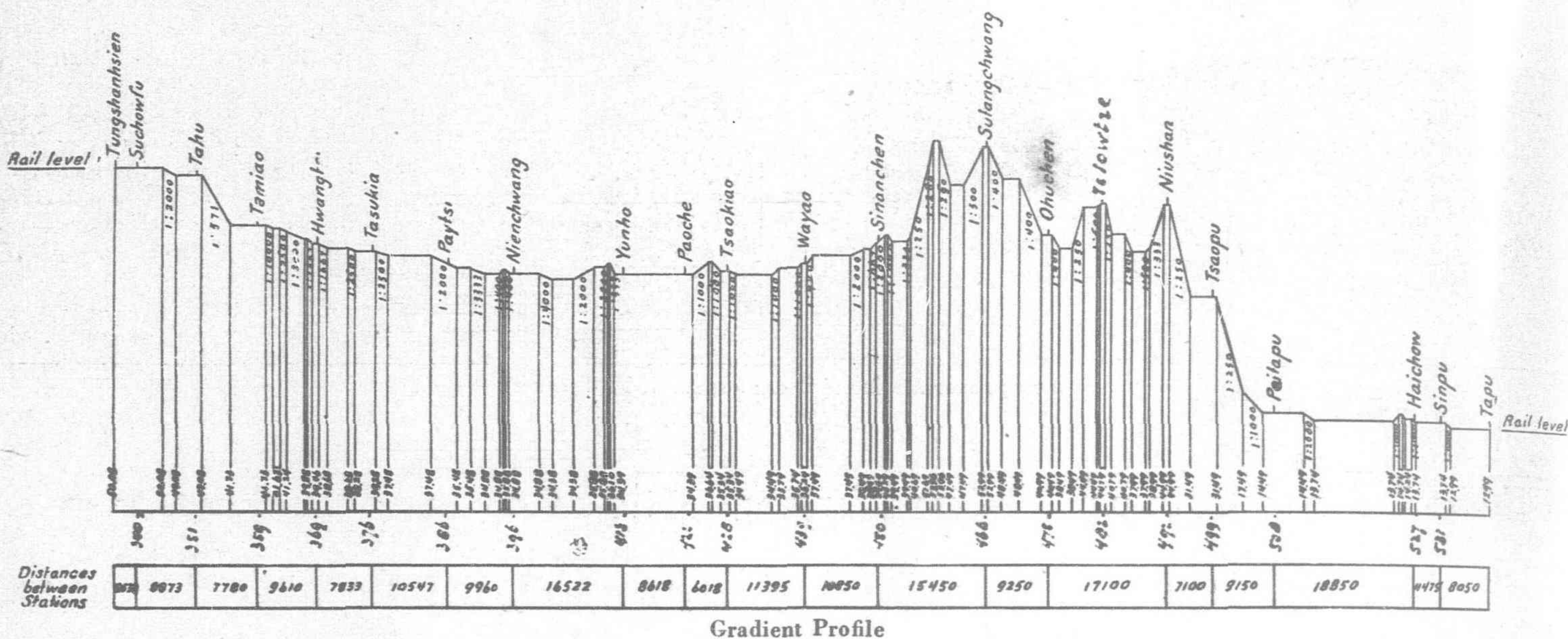
In July 1923 the construction of the two remaining sections between Yunho and the sea was started from both ends. The headquarters on the Yunho end were at Yunho, those at the sea end were established at Haichow, a city about 20 miles from the actual seacoast. At this Haichow end the main line terminates at Sinpu station to be continued in the future to an up-to-date seaport, which is to be built east of Sinpu on the coastline. For the present a branch line from Sinpu to Tapu on the Haichow river will provide the communication with the sea traffic. After dredging the Haichow river from Tapu to beyond the bar which is actually blocking the river entrance, Tapu may be reached by sea-going vessels up to a thousand tons or so.

The materials for the construction of the railway from the Haichow end were shipped by small boats from Tsingtao. Among the materials shipped were a small 9-6-0 shunting engine, weighing about 40 tons and three flat 20 tons cars. By means of this construction-train were built some 30 miles of track before the construction from the other end was met on June 11, 1925.



General Plan Hsuehowfu-Sinpu-Tapu Scale 1:1,000,000

GRADIENT PROFILE

SCALE { vertical 1 : 1000
horizontal 1 : 1000000

The line from Hsuehowfu to the Tapu terminus is practically level throughout. No gradients steeper than 1 in 250 were necessary, the longest incline only being just under 2 miles. The highest embankment is 13-ft. the deepest cutting 20-ft. A few of the cuttings are in rock and advantage of this situation has been taken for the ballast supply of the line. No curves under 1,000 meters (3,333-ft.), radius are laid down in the main line, no station is situated in an incline nor in a curve.

The track is laid of flat-bottomed rails, Chinese standard, 42 kilograms per meter (appr. 85-lbs. per yd.) 9 and 12 meters (30 and 40-ft.) lengths, each 30-ft. rail on 12, each 40-ft. rail on 17 wooden sleepers, the rails fastened by screws, two on each rail in every sleeper. No chairs are used. The joints are opposite, unlike the practice on adjoining Chinese lines, our opinion being that better running and easier maintenance is assured.

The 30-ft. rails and fastenings, of which 50 miles have been laid are of Chinese manufacture, ordered at the Hanyang works just after the European war, before the work started. All the other track materials have been imported from Holland, Belgium, France and Luxemburg.

Limestone ballast has been used from one quarry near Hsuehowfu and from the cuttings in the 2nd and 3rd district. About 20-in. are allowed between rail and formation level, giving a solid ballast foundation in these regions on the extremely soft earth-embankments.

The line which traverses the northernmost plains of Kiangsu province, very near to the Shantung border, is running parallel to extensive mountain ranges in Shantung. Numerous small and large streams are spanned, some of them almost dry in winter but filled up to 20-ft. deep at a width of to 600-ft. during the rain season in summer. The most important of these rivers are mentioned here:

The Grand Canal near Yunho station, where 5 spans of 100-ft. each, carry the line over the river. Abutments and piers are of concrete with a stone facing, on a solid concrete foundation.

The I-Ho, about ten miles further east, spanned by 6 spans of 100-ft. each. Piers and abutments are of stone throughout here, on a concrete foundation.

The Shu Ho just east of Sinanchen station, also 6 spans of 100-ft. Here abutments and piers are of concrete throughout. The Shu Ho, some 7 miles further east is a smaller river crossed on 3 spans of 100-ft. each, this bridge is constructed like the Shu Ho bridge.

The last big bridge is the Haichow river bridge just west of Haichow station, a bridge again of 6 spans of 100-ft. similar to the Shu Ho bridge. This bridge was constructed outside the existing river bed, just where it made a double curve. After completion of the bridge a new river bed was cut passing under the bridge; at the same time the old curves were cut off.

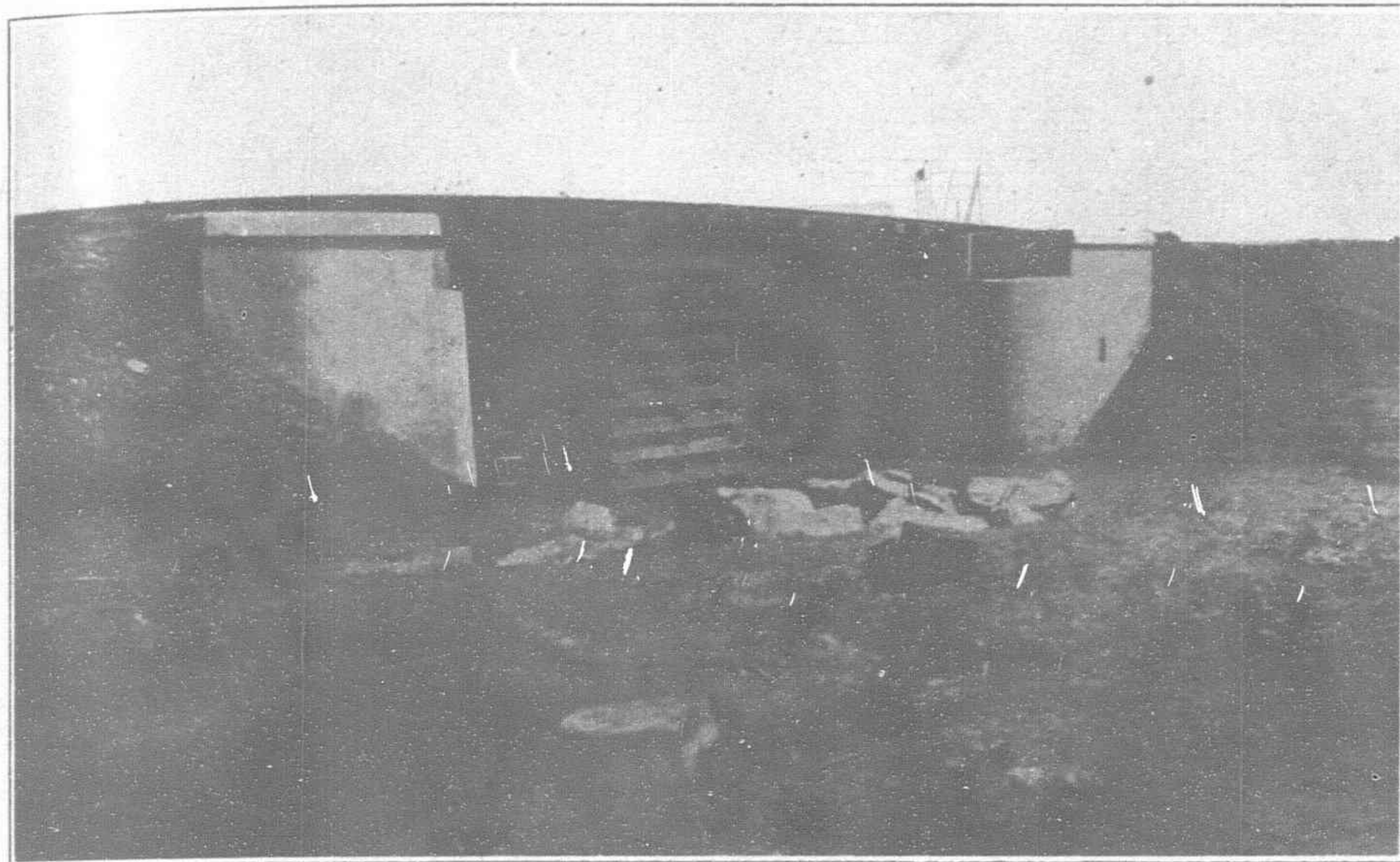
Besides these bigger spans, several smaller have been built with one or more spans of 3,5,6,10,15,20 and 30 Meters (10,16,20,33,50,70 and 100-ft.), and combinations of these dimensions such as a span of 100-ft. in the centre and one of 33-ft. on each side. Altogether the bridge openings amount to 2,457 meters (8,000-ft.), being 12 meters per kilometer of line, or 64-ft. per mile.

The steelwork for all these bridges was partly ordered from Holland, and partly taken over from the western section, who had ordered large quantities of bridge steelwork from Belgium and from the Hanyang works in Hankow.

The stations are from 4 to 7 miles apart, as much as possible planned near important towns and villages. The most important stations are; Yunho at the crossing of the Grand Canal, at the same time an



E. R. Hondelink, Chief Engineer, Lunghai Railway



33-ft. Span Bridge with Temporary Track

engine and watering station. Then Sinanchen at the crossing of the Shu Ho, also a watering station. At the east end three stations, Haichow for the town of that name, an important passenger station, Sinpu, 2 miles from Haichow for the commercial town of Sinpu and Tapu the terminus on the Haichow river. Besides Yunho, Sinanchen and Haichow, already named, water plants are built at Tasukia between Hsuehowfu and Yunho and at Talowtze between Sinanchen and Haichow.

All station buildings are erected in semi-Chinese style, hollow brickwalls on a stone foundation and a Chinese roof, the stations near the cuttings through the limestone are built entirely in stone.

Each station has at least one platform of standard width (30-ft.), and length of 500-ft., 30-in. above rail-level. Each station—one small wayside halt in the Hsuehowfu-Yunho section excepted—has at least one crossing loop and most of the stations have one or more goods sidings.

The line will be completed for regular traffic in September next. It will be worked as one line with the existing western section of the

Lunghai Railway and the Pienlo Railway, which runs from Shanchow to Hsuehowfu. The traffic expected consists in agricultural products from the west for export, and coal from the Honan and the Shantung mines along the Tientsin-Pukow railway, north of Hsuehowfu. Further, salt from the important salt regions round Haichow in the return direction.

The rolling stock of the existing Lunghai and Pienlo lines will be used, which has been completed by eight 2-8-2 heavy goods locomotives, and 200 open and covered cars, supplied by Dutch firms.

As mentioned already a scheme for a modern seaport is being studied, which ulteriorly must greatly improve the terminus facilities.

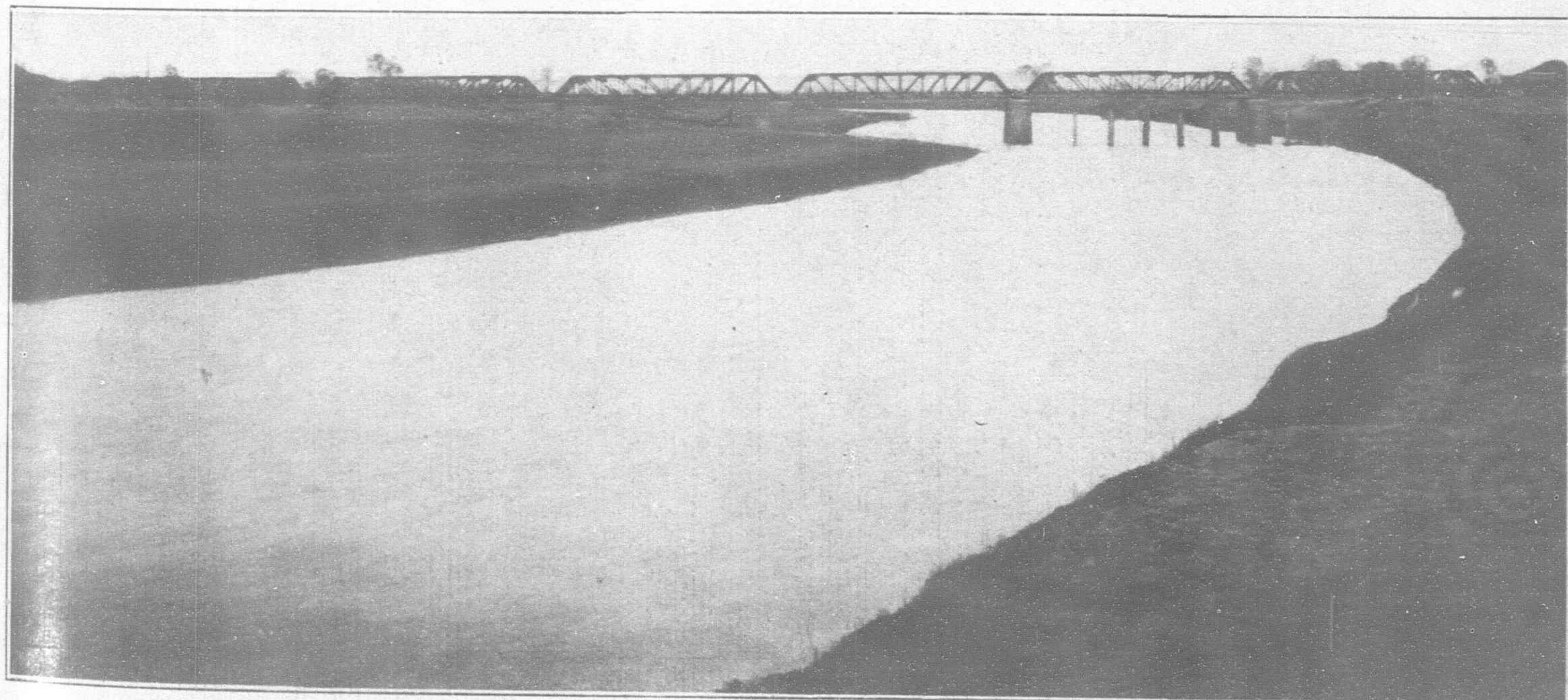
The eastern section has been constructed under foreign supervision, with the assistance of Chinese engineers, all works have been let out on contracts to Chinese contractors.

The total cost of the line has been approximately Mex. \$8,000,000 which works out at about \$40,000 per kilometer or \$64,000 per mile.

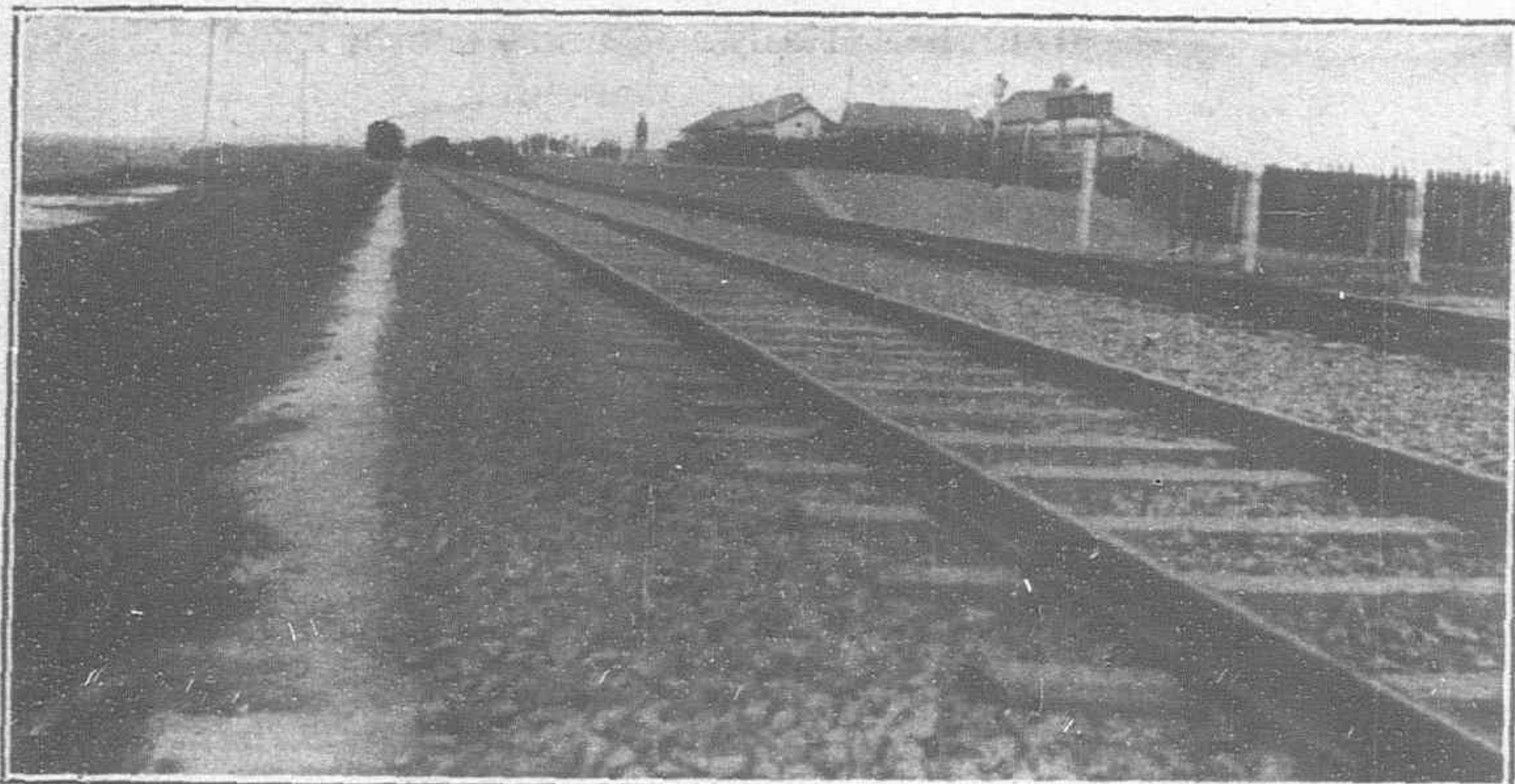
The work has been hindered by the floods of 1921, 1924 and 1925 as well as by the civil war of 1924-1925, but serious accidents have not been met with.



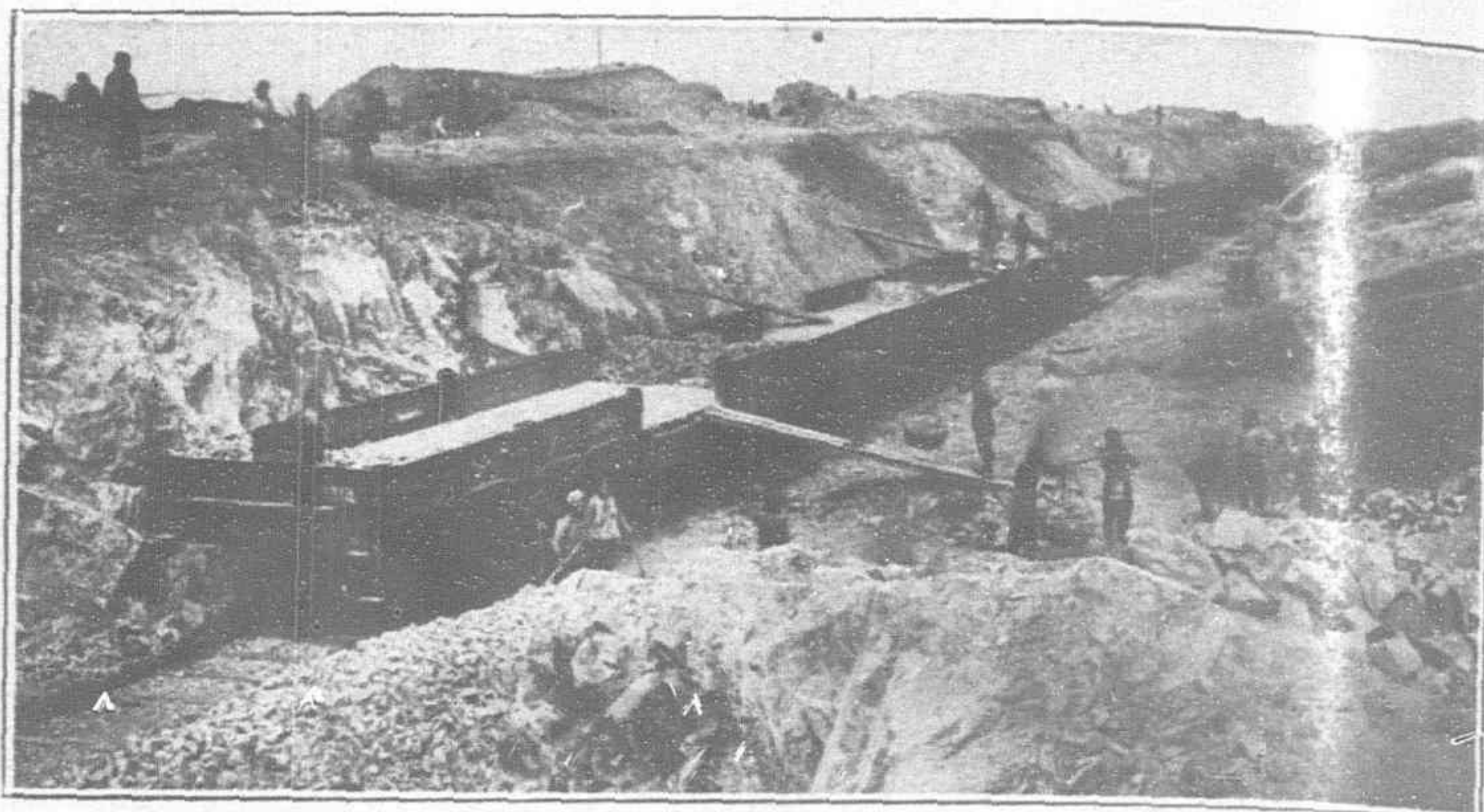
Typical Staff Quarters



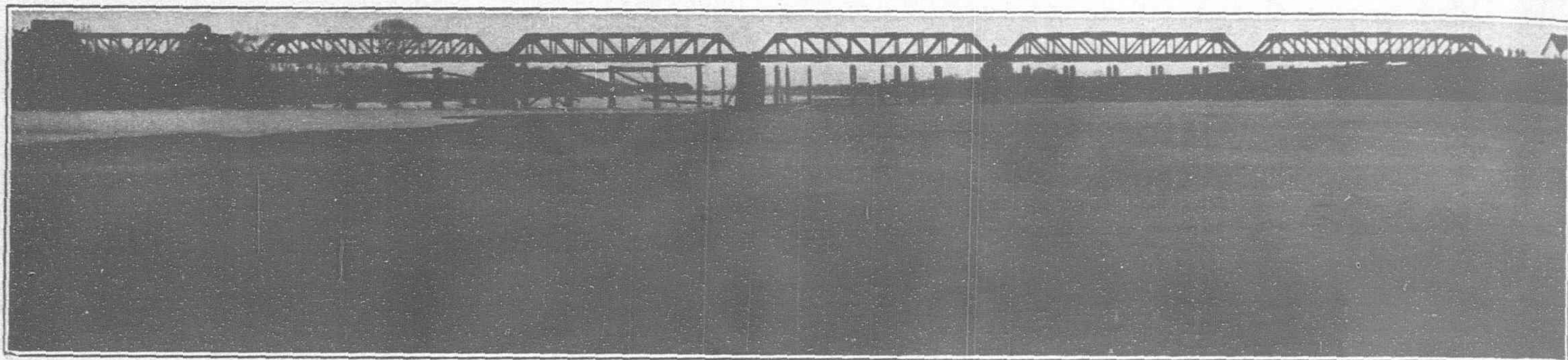
I-Ho Bridge, 54 miles from Hsuehowfu 6 spans 100-ft. each. In summer this river has a very strong current



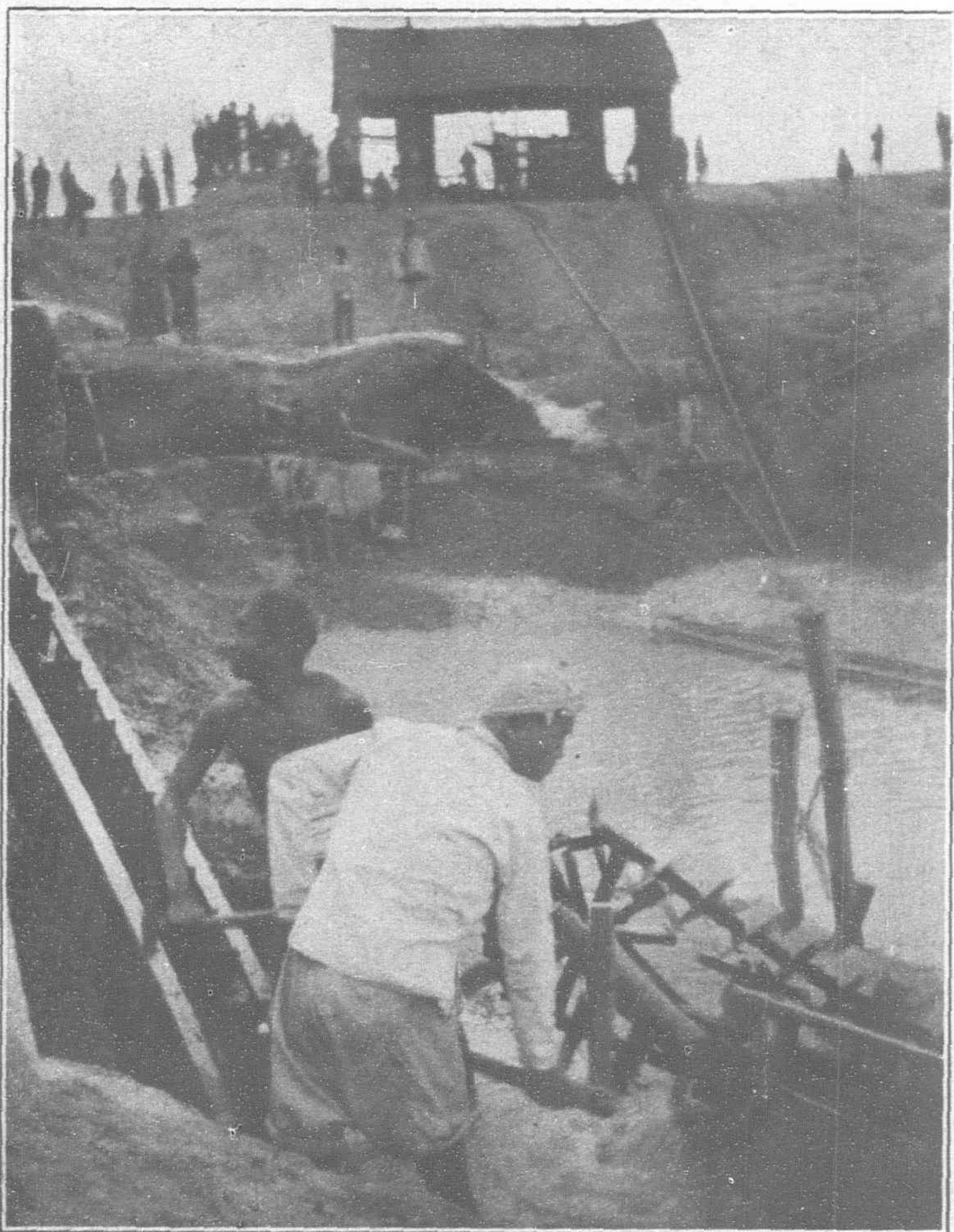
Pay Tsi, an Important Intermediary Station, 30 miles from Hsuehowfu



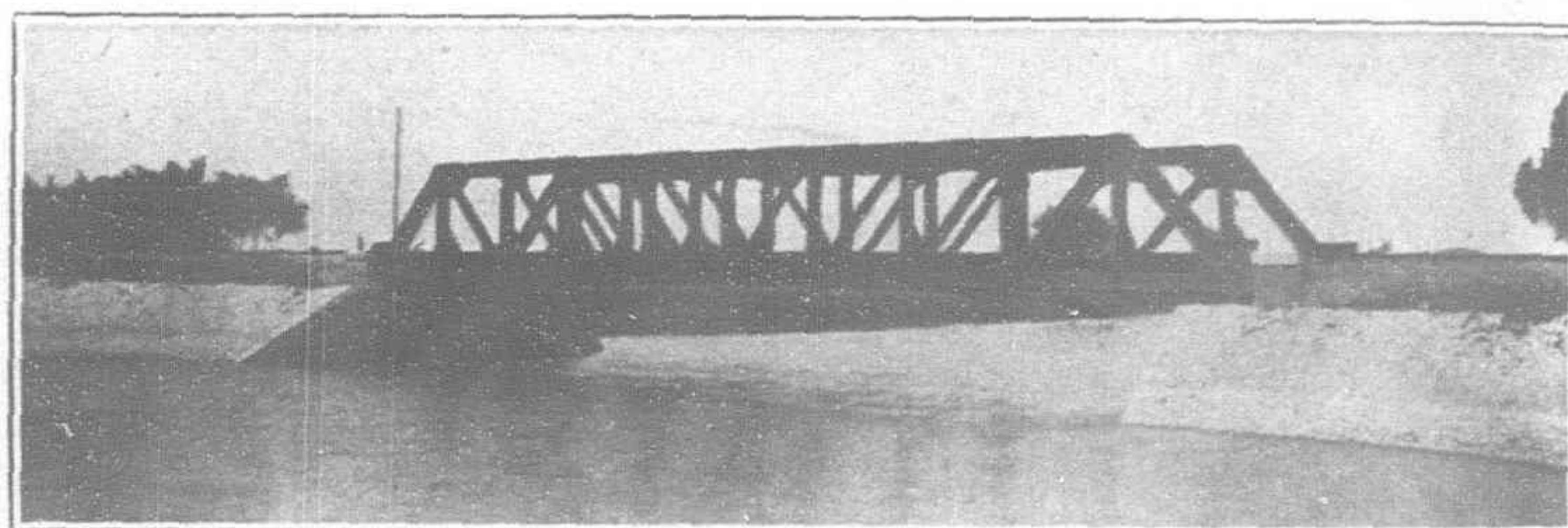
Loading Ballast in the Second Cutting at Malingshan



Shu Ho Bridge, 6 Spans of 100-ft. 70 miles from Hsuehowfu



Excavation Work on the Grand Canal



100-ft. Span Bridge over a Creek



Shu Ho Bridge

Copper in the Philippines

HERE has been practically no production of copper during American occupation, although development work on the old Mankayan properties continues. Many examinations of this deposit have been made which reveal a fairly extensive, low-grade body of enargite. Practically the only economical way to handle this ore is to export it to some neighboring country where there are smelters. The copper market is too uncertain and the local obstacles, such as transportation, lack of timber, cost of smelter, labor, etc., are so great as hardly to be overcome.

Mention is made, in the earliest known records, of the existence of copper in the ancient province of Tuy, now called Mountain Province. When the Spaniards first landed in the Philippines they heard of copper smelting by the "Ugolotes," as the mountain people were then called. It seems very evident that the Chinese or Japanese taught them the art, probably in the days of Limahong, the noted Chinese pirate who invaded the Philippines in the sixteenth century and landed at Laoag, Ilocos Norte Province.

The copper deposits are located in and about the barrio of Mankayan, which is situated on a small plateau in the Cordillera Central of northern Luzon, about 16 kilometers south of Cervantes on Abra River. Mankayan is 264 kilometers due north of Manila, and 64 kilometers southeast of Candon and is reached from Manila by an excellent, graded horse trail from which there is a good trail, passable for bull carts, over the famous Tiela Pass. Mankayan is situated at an elevation of about 1,140 meters above sea level, and is distant from the coast town of Tagudin about 37 kilometers. The plateau is practically treeless, but there is more or less scattered pine timber on the adjacent hills and mountains.

The ore consists largely of arsenate of copper, with some secondary tetrahedrite in a quartz gangue. Secondary enrichment is clearly evident in the deposit at Mankayan. The main mass of the ore is of low grade (less than 2 per cent.), but there is a considerable body that yields 5 per cent. and more. Some very rich spots also exist. The following copper minerals have been found in this deposit: Enargite, luzonite (a special crystallization form of enargite), tetrahedrite, chalcopryite, chalcocite, chalcantite, azurite, and malachite.

The principal rock mass is diorite. This is capped by a so-called "trachyte" which is really a quartz porphyry. To the west is a great intrusive mass of quartz-diorite, known as the Bagan granite, while a little farther away and to the east is Mount Data, which consists largely of Tertiary andesitic agglomerates.

Eveland, (236) who in 1904 made the only geologic reconnaissance of this region, says of this deposit:

The former attempts to explain the Mankayan deposit have been given and objections to each have been found, and as a mere tentative hypothesis may be suggested a genesis of these ores as yet not considered, that will be determined when further development work is done. It is entirely within the grounds of probability, and not in conflict with any geological evidence so far at hand, to presume that, before the advent of the trachyte flow, ore deposits had been formed in the Mankayan diorite of a type similar to those at Suyoc—quartz veins carrying metallic sulphides and gold values. With the covering of the diorite and its veins by an igneous flow, chemical action was given an added impetus. The trachyte, easily decomposed and altered, was metamorphosed at its

contact with the diorite to a hard, flinty, siliceous quartz porphyry, quartz replacing most of the other constituents of the rock. In its cooling and subsequent contraction fissures and crevices were formed, aided possibly by dynamic action, such as shattering shocks, which are a feature of the Islands. The heat of the overlying trachyte furnished a motive power for the process of vein deposition, and the heated waters, assumed to be rising, filled the cavities and cracks with silica and ore minerals obtained from lower or surrounding sources. Enargite is a prominent mineral among those formed by secondary action, and investigation shows that it has been formed later than the other minerals; so that the evidence points to a secondary enrichment of certain portions of the contact, notably at Mankayan, with copper minerals obtained from other sources. Deposition has taken place in all possible directions, leaving the irregular mass of veins of the Mankayan mine.

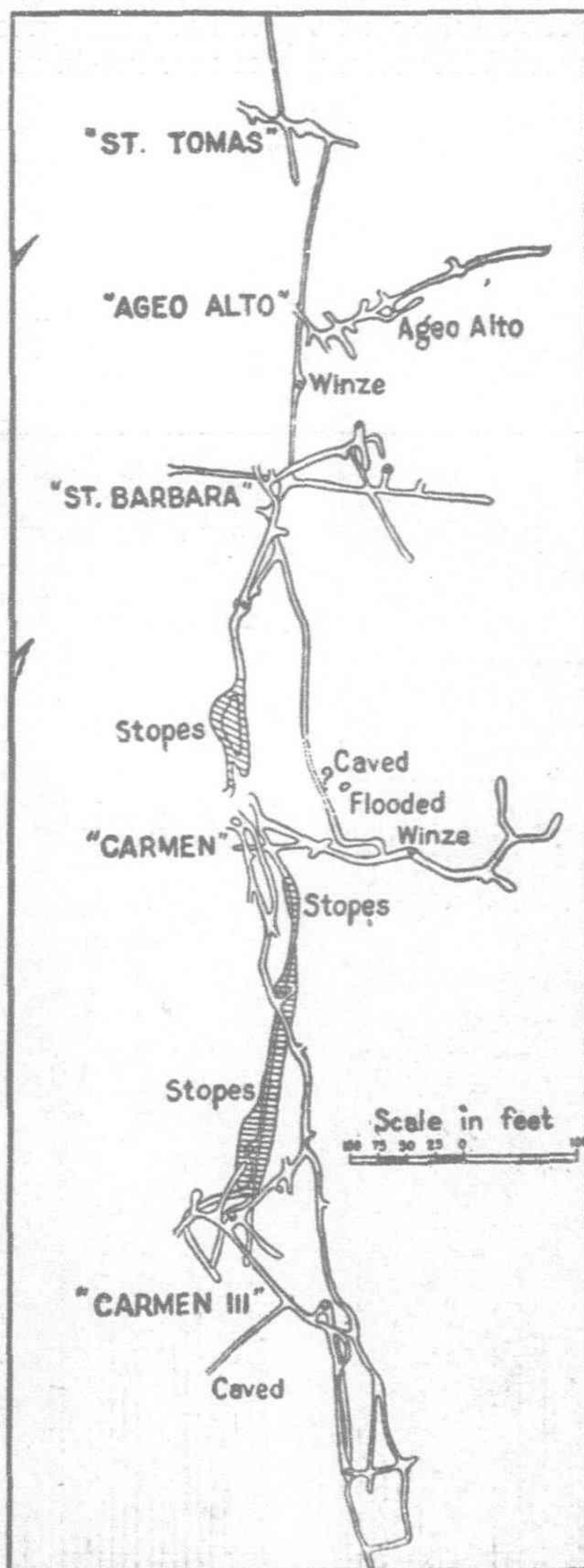
The influence of the granitic intrusion which cuts the older diorite seems not to have been considered by Eveland in the genesis of this ore deposit, but I am of the opinion that it has had a great deal to do with the mineralization of the region under discussion.

Santos, the eminent Spanish engineer, who was in charge of the Cantabro-Filipino Company in 1860, says of the local method of working and smelting these ores:

The mineral after being extracted from the mine is submitted first to a roasting, or, better yet, a crude melting; for this the natives open in the ground a hole one cuarta in diameter by two or three fingers deep, which they cover with some thin sticks forming a gridiron, above which they place a small, compact heap of mineral, held down by a board or piece of tree; and they cover all with thin pine wood, leaving a protected hollow above the board. They ignite this at once, leaving it alone until it has consumed the wood and completely heated the sulphur of the mineral, which takes two or three hours. The products are an impure mass of copper mixed with earthen substances and pieces of coal and scorias of quartz which offer the aspect of a breccia in which the cement has partly disappeared, converting it into a porous mass.

The copper matter then suffers a melting process for black copper, which they execute in the following manner: They make a hole six or eight fingers in diameter which they surround with stones forming a species of hearth or crucible, leaving an open space for the placing of a pipe connecting with a cylinder bellows. This consists of two cylinders made from a hollowed trunk of pine in which run pistons formed by blocks of wood dressed on their circumferences with dry herbs and chicken feathers, which are held down only by the bellows, so they work in the manner of springs against the interior surface of the cylinders. In the lower part there is a hole and in that they place a cane, closing the valve at the beginning of the stroke.

Having formed the oven in this manner they charge it with pine fuel, mixed copper and matter, and put the bellows in motion, taking care to add the fuel in proportion to its consumption, and to agitate little by little with a cane so the copper may fall to the bottom and be cleaned from the foreign substances with which it may be mixed. When they know that the copper has all united into one mass, which should take place after ten or fifteen minutes, they stop the bellows and take out the coal and scorias which overflow the



Plan of the underground workings of the Santa Barbara copper mine, in Mankayan, Lepanto. Survey by Goodman and Ickis

metallic bath, leaving it uncovered until it has hardened a little and acquired sufficient consistency so that it may be handled. The product is a cake of black copper of rough and broken surface full of earth and pieces of fuel.

This cake they place at once on a bonfire, where they leave it two or three hours, making it suffer a kind of roasting process which purifies it somewhat, and they afterwards melt it in the same furnace, placing it in a species of crucible or mold of refractory clay. At the end of this they put the crucible in the hole and over it they place the stone cover and surround it with fuel. They then force a blast, and after the copper is melted they uncover the bath, taking out all the impurities. They remove the crucible from the furnace, and later, when the mass has commenced to consolidate, they compress it with a stick. Finally they take the cake from the crucible, bury it in ashes until it has cooled, and smooth its surface a little by striking it with a stone.

The copper obtained in this manner they sell partly in cakes to the Christian people in the lowlands, and partly dedicate to the manufacture of pots and boilers which the Igorots forge with stones; also making of the same metal bars, tongs, and small pipes for smoking.

The Cantabro-Filipino Company was organized about 1860 with the Spanish engineer Santos in charge of the works. This company undertook to carry on more modern operations and partially succeeded. Between 1860 and 1875 they extracted 2,500,000 pounds of copper. In the latter year Santos died at the mines, and all operations ceased soon after. Since then only desultory smelting has been carried on by Chinese and Igorots, who made considerable profits out of the rich dumps about the old Santa Barbara mine (fig. 20), the scene of the principal activities of the company.

At present (June, 1921) the P. C. Whitaker interests, with Victor Lednický as mining engineer, are continuing the development of this property by driving two tunnels 32.7 meters and 65.4 meters, respectively, below (in elevation) the old Spanish drainage tunnel.

Tunnel No. 1 is now 170 meters long, and No. 2 is 225 meters long, with a 40-meter drift. The vein in the lower tunnel is about 17 meters wide, strike north 45° west, dip 65° northeast, and is said to yield about 2 per cent. copper.

The deposits have been examined by several good engineers, who agree that there is an important body of ore in sight, averaging close to 2 per cent., with some very rich spots. The chief difficulties are transportation; lack of coke, which would have to be brought in or the ore shipped out; distance to a flux; and scarcity of timber and labor.

The only economical solution of this problem seems to be to concentrate the ore and ship it to Japan for smelting.

Other Copper Deposits

Copper in noticeable amounts has been found in at least two other localities in the Archipelago, but in neither has production attained any importance.

At Milagros, on the southwest coast of Masbate, native copper in andesite was worked some years ago, but no production has ever been recorded.

In the Loboo Mountains of Batangas Province I examined some gold- and copper-bearing quartz veins but, as a result of my unfavorable report, work on them ceased in 1905.

Near Sual, Pangasinan, some chalcopryite deposits have been worked from time to time, but they have never attained any importance.

Some copper-bearing siliceous veins in andesite were prospected in 1913 and 1914, on the headwaters of Pula River, a branch of the Aglao, in the Zambales Mountains of Luzon, but nothing of any moment has resulted from the prospects.

The uncertainty of the copper market, the difficulty of treating the ore, and proximity to the Japanese producers will always make copper mining in the Philippines a doubtful venture that should be undertaken by experienced persons only.

Clark H. Minor New Head of I.G.E.

Announcement has been made by the International General Electric Company that Mr. Clark H. Minor, former vice-president of the company, has been elected president, to succeed Mr. Anson W. Burchard, who has been both president and chairman of the board. Mr. Burchard will continue as chairman, but asked that he be relieved of some of the duties of his double position. Mr. Minor has just returned from Europe, and Mr. Burchard has just left for there.

Mr. Clark H. Minor, president of the International General Electric Company, entered the employ of the Western Electric Company in the New York office in 1902, following graduation from Hamilton College. In 1909 he was transferred from Kansas City to Antwerp, Belgium, as managing director of the Bell Telephone Company there. He remained in Belgium until after the outbreak of the war in 1914.

Mr. Minor was sent to China in 1918, and while there organized the China Electric Company, Ltd. for the manufacture of telephone apparatus. He was general manager of the company, with headquarters in Peking.

In 1921 Mr. Minor went to London as European commercial manager of the International Western Electric Company. He resigned in 1924, and later was elected a vice-president of the International General Electric Company, in which company he was later made a director. At the meeting of the board of the International General Electric Company in June 1925 he was named president of the Company.

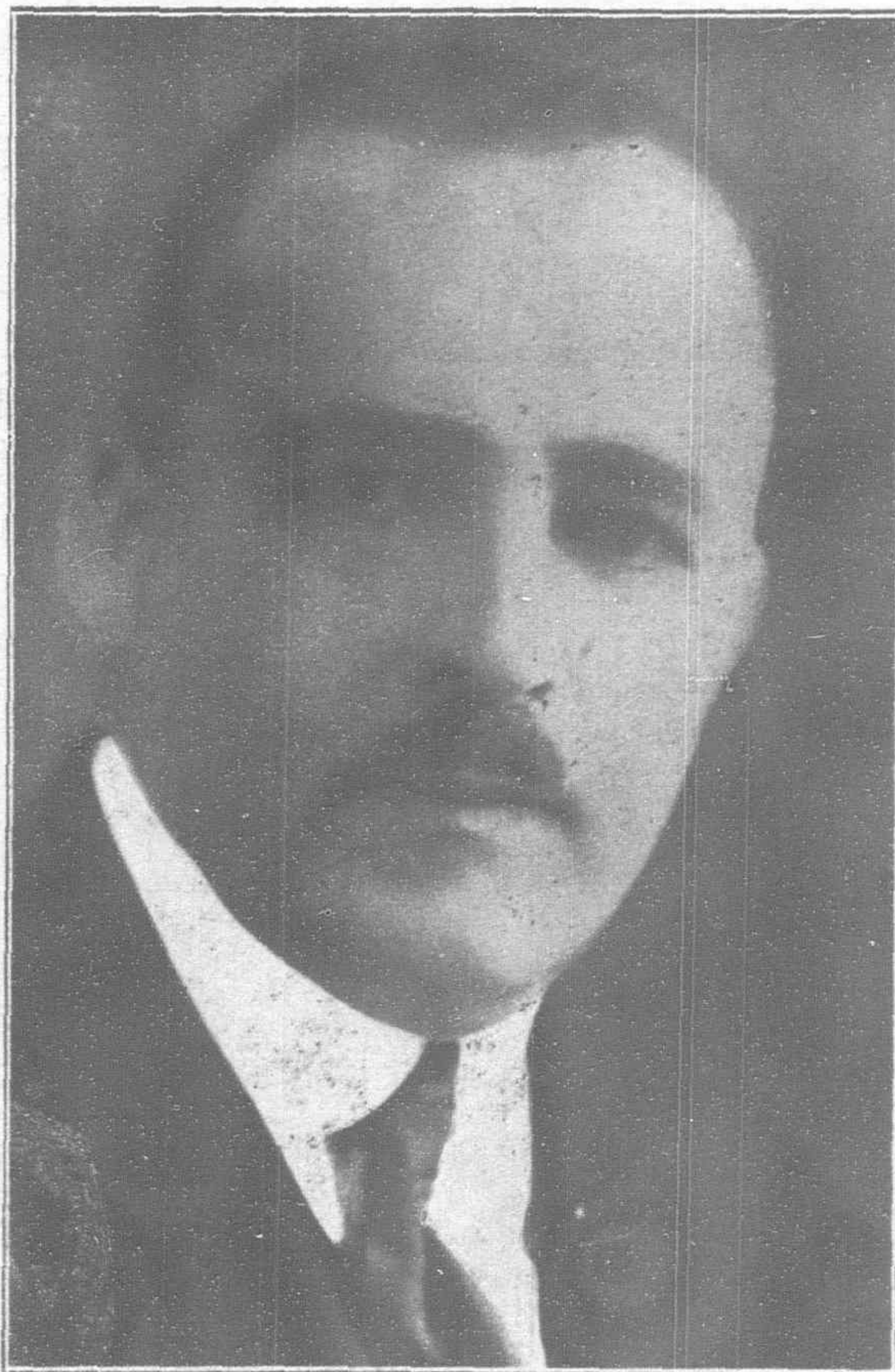
Mr. Loren Emery, former Assistant Merchandising Manager of the International General Electric Company, has been made General Merchandising Manager of the Company.

Mr. R. G. Henderson, who has been in Europe for the past year and a half conducting important negotiations for the International General Electric Company, with particular reference to merchandising lines, has been relieved of the duties of General Merchandising Manager and has been assigned to special work in connection with problems of sales promotion.

Mr. Loren Emery, General Merchandising Manager of the International General Electric Company, entered the employ of the General Electric Company in 1909. After taking the course in supply salesmanship, he handled the sale of incandescent lamps in the foreign department. He was then transferred to the Latin-American section, and became assistant manager of the Latin-American sales.

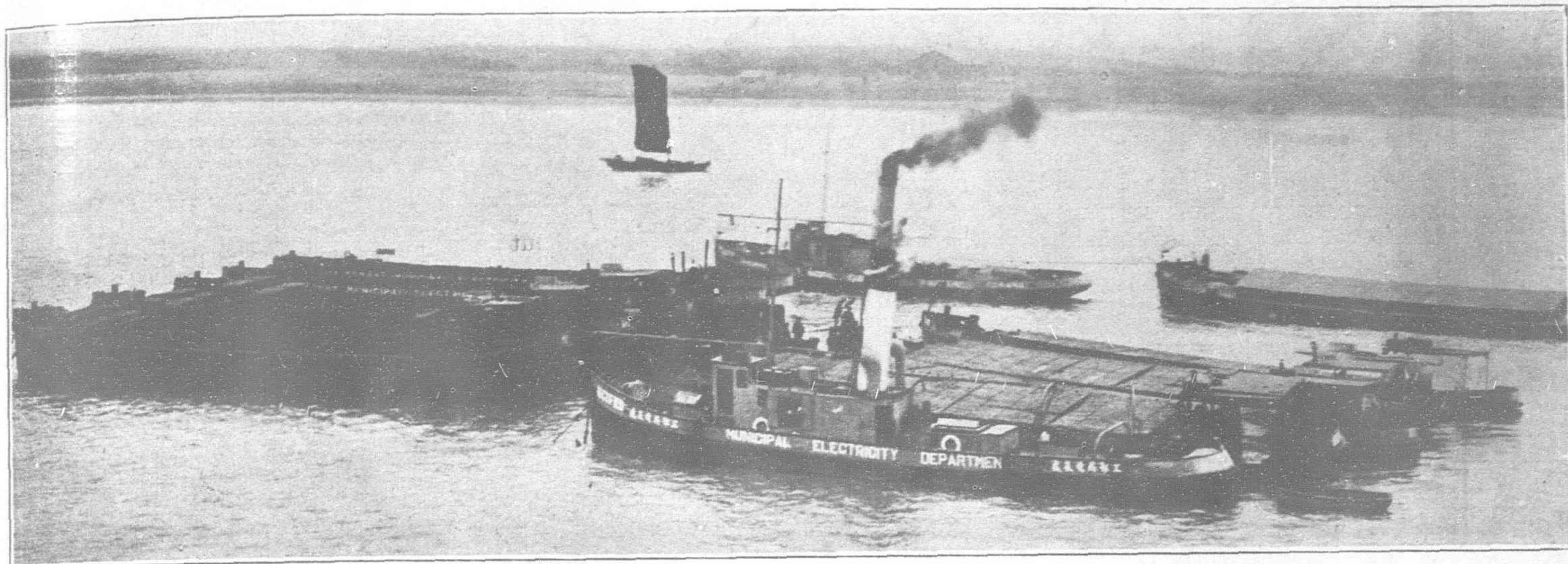
In 1914 he was sent as special representative in the West Indies, and while there established the Porto Rican and Cuban offices of the company. In 1917 he visited Cuba, Porto Rico, Central America and Colombia for the Company.

Upon his return to the United States in 1920, Mr. Emery was made Manager of the Latin-American Sales. He became Sales Manager of the Department of Americas in 1921, and in 1922 was transferred to the Merchandising Department as Assistant Merchandising Manager, which post he held until his present appointment.



CLARK H. MINOR

President, International General Electric Company, Inc.



Coaling Fleet Together with Tow Boats "Reactor" and "Rectifier Riverside Power Station

The Electricity Supply of Shanghai

IN his annual report, the Engineer-in-chief and manager of the Shanghai Municipal Electricity Department shows the tremendous progress which has been made in this field. He says:

The year under review has been characterised by acute trade depression and by inter-provincial warfare, having its scene of action in the immediate vicinity of Shanghai, and as a consequence paralysing many business and industrial activities. Nevertheless, the sales of electricity during the period under review have increased from 272,265,861 to 307,307,401 kilowatt-hours, representing an increase of 12.87 per cent. which, although less than the preceding year, may, in the circumstances detailed, be regarded as satisfactory. The result of the year's trading shows a nett profit, after payment of interest and other nett revenue charges, of Tls. 1,464,162. The estimated nett profit for the year was Tls. 1,354,800.

Due to a continuance of depressed conditions, aggravated by local warfare, the increase recorded in industrial supply demand is disappointing, as will be evidenced by the relatively small increase in the maximum demand. On the other hand the increase in the sale of electricity in relation to the connected demand indicates a very satisfactory state of affairs, the load factor of 55.12 per cent. being exceptionally high and being a helpful factor in enabling the department to supply electricity at the attractive rates available. The financial standing of the undertaking at December 31, 1924, is:—

Capital Outlay of the Undertaking	Tls. 30,476,329
" " on plant actually in use	29,736,409
Return on capital outlay actually in use	10.64%
Revenue from sales of Electricity, Rent of Motors, etc.	9,227,027
Gross Profit (after allowing for Depreciation) ..	3,164,337
Nett Profit after provision for interest on loans and other nett revenue Expenditure	1,464,162

The estimated nett profit for the year 1925 is Tls. 1,015,200. This, it will be noted, is considerably less than the profit for 1924, and is accounted for by the reduction in the charges for lighting (2 cands.) and heating, etc. (5 cands.), which come into effect from the beginning of 1925.

Since 1916, the General Municipal Funds have benefited to the extent of Tls. 4,660,000 consequent upon profits of the working of the department which have been handed over to the Council during that time, the contribution for the year under review being Tls. 900,000.

Results such as these can only be obtained by a full measure of co-operation on the part of every section of the staff.

The installed plant capacity of the Riverside Power Station is 121,000 kilowatts, this figure including the 20,000 kilowatt Turbine destroyed at the end of 1923 and now in process of replacement.

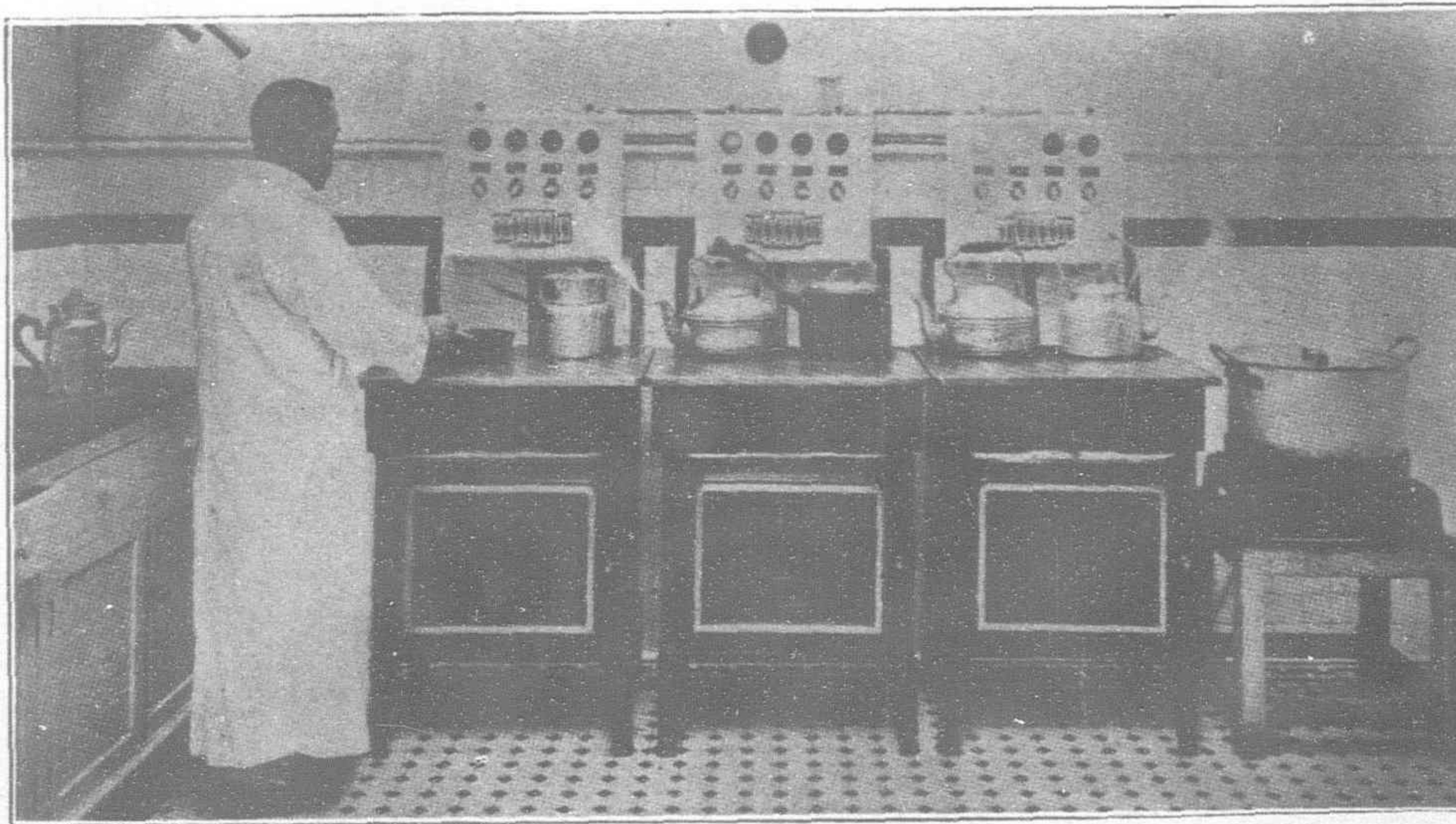
The year has been noteworthy in that it has seen the passing of Fearon Road Generating Station, which has been completely dismantled and is now in process of being converted into central stores premises.

The highest maximum load recorded during the year was 66,200 kilowatts. The maximum load delivered to the distributing feeders at the same time was 63,459 kilowatts, an increase of 0.88 per cent., as compared with a 22.52 per

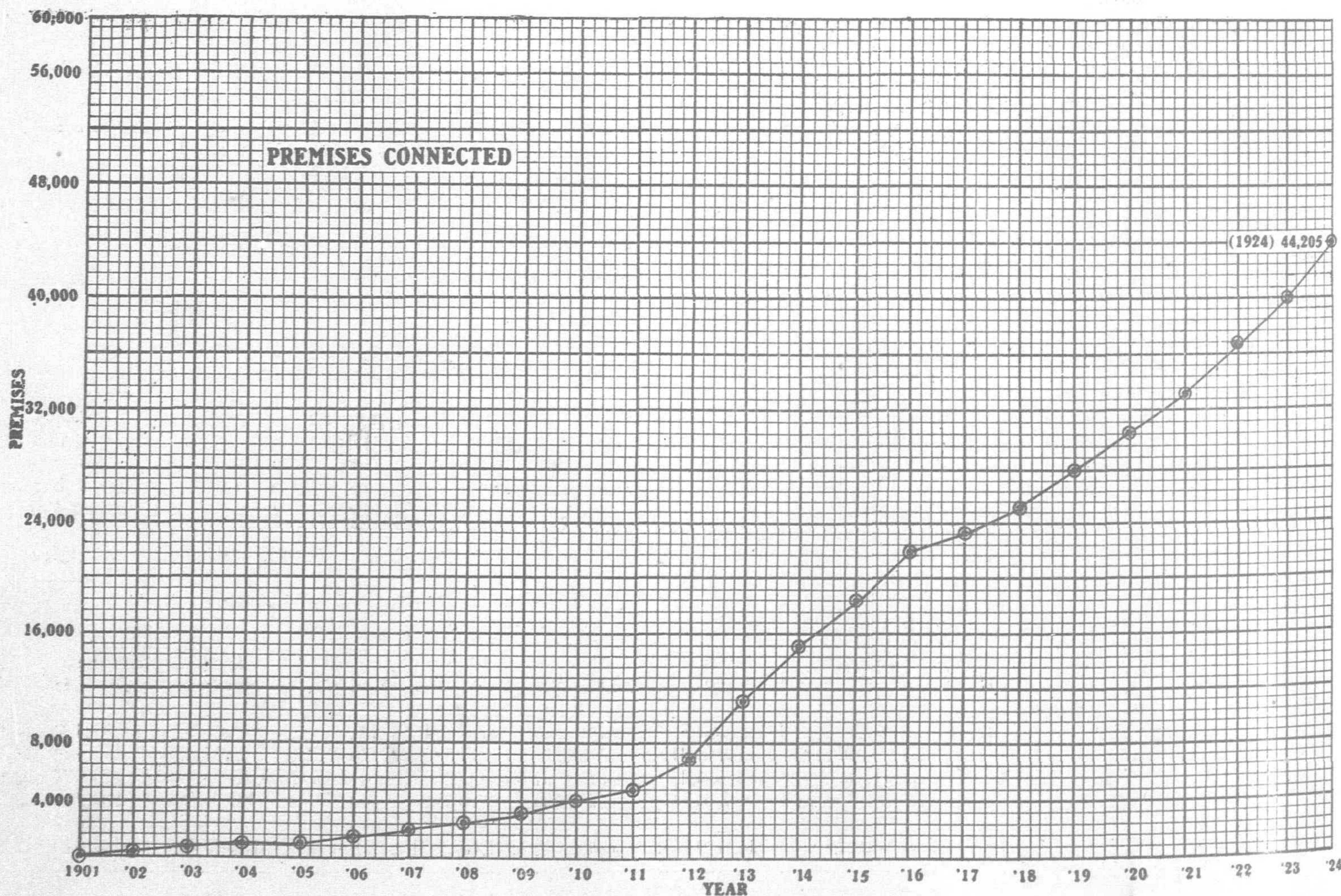
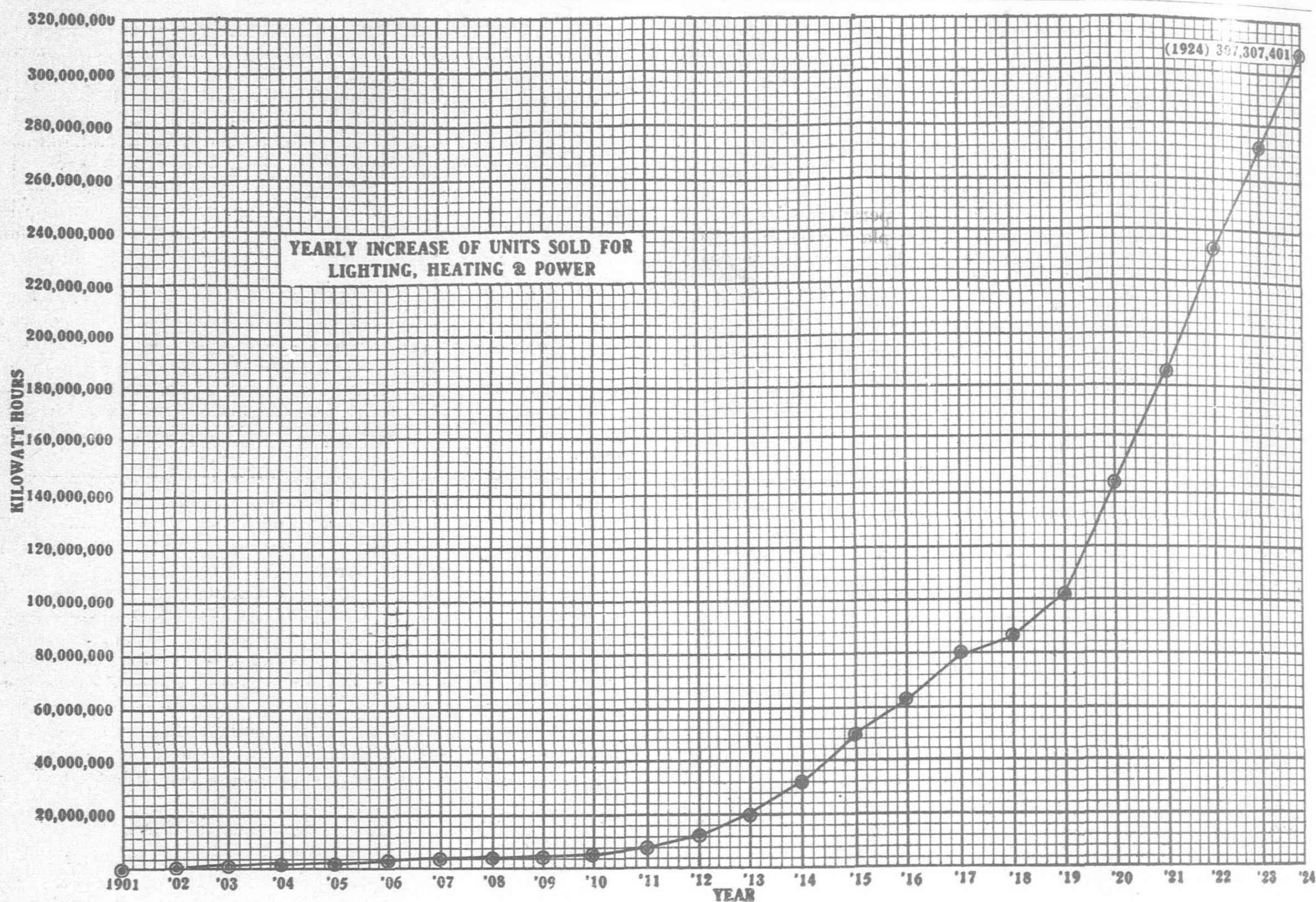
cent. increase realised in 1923. The load factor has increased from 49.42 per cent. to 55.12 per cent.

It is useful to compare data concerning the operation of this undertaking with that of the four largest Municipally owned electricity undertakings in Great Britain as set out below:—

Year Ending	Undertaking	Units Sold for Year	Maximum Demand in Kilowatts	Load Factor %
1924	Shanghai	307,307,401	63,459	55.12
"	Manchester	222,203,023	108,320	30.79
"	Birmingham	171,152,590	88,869	26.19
"	Glasgow	166,087,836	81,700	28.69
"	Sheffield	151,896,004	72,487	28.69



Battery of 3 Electric Cookers in a Shanghai Messroom with a Separate Water Boiler



Data concerning comparative economic results will be found elsewhere in this report.

Kilowatt Hours Generated

The total kilowatt hours generated amounted to 361,361,250, of which Riverside generated 359,316,168 and Fearon Road 2,045,082, the percentage of total kilowatt hours generated by Fearon Road being negligible, namely 0.566 per cent.

The kilowatt hours expended in the operation of auxiliaries required in connection with the generating plant were 26,127,973, or 7.23 per cent. of the total generated, the figures for the three previous years in respect of this usage being 8.44 per cent., 6.86 per cent. and 6.59 per cent. respectively. In considering these figures, however, it is necessary to bear in mind that 4,814,420 kilowatt hours were used in connection with the operation of synchronous condensers which are installed for the purpose of effecting economy in distribution, hence this expenditure of energy cannot be regarded in the same light as the expenditure required in the operation of generating plant auxiliaries, in that a definite gain in working economy results as a consequence of the expenditure of this energy, this gain being evidenced in increased efficiency of distribution. 441,714 kilowatt hours were used for miscellaneous Departmental purposes, such including lighting and heating of depots, godowns, offices and showrooms, together with electrical energy used for testing purposes.

The total kilowatt hours sold amounted to 307,307,401, an increase of 12.87 per cent. over 1923.

Consumers Supplied

There were 36,519 consumers being supplied at the end of the year, compared with 32,921 at the end of 1923, an increase of 3,598. The new connections added during the year amounted to 12,491 kilowatts. As stated in the report for 1923, the connected kilowatts represented by Public Street Lighting and the Tramway Company's demand had not previously been included, but in order to make the totals complete and accurate these are now included, being 361 and 4,013 kilowatts respectively. The total kilowatts connected are now 127,440.

Generation

In matters connected with the generation of supply the year has been mainly noteworthy because of the results achieved in the improvement of efficiency of generation. Comparing these results with those obtained by stations of similar capacity in Great Britain, the average fuel consumption at Riverside is some 1.3 per cent. less. This may be regarded as particularly satisfactory when the adverse factors associated with native labour and relatively poor fuel are taken into consideration.

The overall Thermal efficiency of the Riverside Generating Station was 16.2 per cent., as compared with 14.25 per cent for the previous year, this showing a substantial increase and in this connection it is noteworthy that the average expenditure of British Thermal Units per kilowatt hour generated throughout the year, i.e., 21,047, compares very favourably with the results obtained in other generating stations of similar capacity throughout the world. The best efficiency obtained was 19,271 British Thermal Units per kilowatt hour generated, which may be regarded with very satisfaction. There is every reason to anticipate further increase of the overall efficiency during 1925.

These achievements are of vital interest to the department at the present time, enabling selling rates to be quoted in respect of industrial supply which are such as to discount the alternative method of obtaining the desired supply, namely, the installation of individual plants. The results have also gone far to enable a substantial decrease in the lighting rates to be announced at the close of the year.

Relatively little new work has been initiated at the Generating Station during the year under review, attention being given in the main to the completion of work already in hand, and to the carrying out of minor work having for its purpose increase in efficiency. Of the more important work may be mentioned the completion of the Messroom for the foreign employes and of the Time Office buildings, also the construction of an Ash Wharf now nearing completion. The building and putting into commission of a fleet consisting of two sea going tow boats, twelve coal lighters and four ash hopper lighters, is worthy of mention, in that the results of the commissioning of these boats have already justified the capital outlay.

Distribution

Whilst the mileage of new cables laid during the year shows a falling off as compared with some previous years, the actual amount of work in connection with jointing shows a considerable increase, due, in part, to putting the new super-substations at Fearon Road and Yangchow Road into commission, and also to work in connection with the new 22,000 volt Switch House at Riverside Power Station.

Work in connection with new extensions, alterations and renewals to the overhead mains shows a general increase of about 20 per cent. over the previous year. An unusually large number of alterations were incurred due to the extensive road widening operations which have been in progress.

The year 1924 was one of exceptional activity for the substation department, as, included amongst the 19 new substations which were commissioned during the year were two super-substations, i.e., Fearon Road and Yangchow Road. The Fearon Road Station was commissioned in the Spring, when all cables were transferred from the old Fearon Road Power Station to the new building. Later in the year the full complement of synchronous motor generators was installed in the new substation and all traction load transferred from the old steam plant, which was then dismantled.

Summary of Underground Work

	Laid during 1924.	Total laid to 31st December, 1924.
22,000 Volt Cable	.. 0.51 miles	119.11 miles
6,600 " "	.. 13.75 "	117.85 "
Telephone and Pilot Cable	2.75 "	55.94 "
Public Lighting Cable	.. .21 "	4.19 "
Low Tension Cable	.. 2.19 "	26.72 "
	19.41 miles	323.81 miles

Total number of Joints and End Boxes made during 1924 612
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Summary of Overhead Work

6,600 Volt Mains extended 12.7 miles
" " " dismantled 5.3 "
L. T. Mains extended	.. .. . 92.4 "
L. T. Mains dismantled	.. .. . 42.4 "
Public and Private Street Lighting mains extended	.. .. . 60.0 "
New Poles Erected	.. .. . 2,357
Poles renewed	.. .. . 1,659
New House Service Connections	.. .. . 5,641
House Service Disconnections	.. .. . 1,699
Nett Increase	3,942

(Continued on page 616).

	1918	1919	1920	1921	1922	1923	1924	Increase	%
Private Lighting	.. .. 14,444,261	16,378,793	20,298,672	22,458,625	24,793,079	27,626,473	29,418,821	1,792,348	6.49
Public and Private Street Lighting	.. .. 1,141,973	1,192,650	1,454,812	1,703,212	1,836,419	2,182,615	2,269,795	87,180	3.99
Heating and Cooking	.. .. 899,852	952,814	1,240,136	1,311,970	1,672,459	2,059,774	2,404,590	344,816	16.74
Power	.. .. 66,024,895	79,622,548	116,839,147	154,898,657	198,549,509	234,419,732	267,043,809	32,624,077	13.92
Traction	.. .. 3,764,678	4,191,332	4,706,865	4,992,282	5,605,895	5,977,267	6,170,386	193,119	3.23
	86,275,659	102,338,137	144,539,632	185,364,746	232,457,361	272,265,861	307,307,401	35,041,540	12.87

The Selemdja Alluvial Gold Deposits

Amur Province, Eastern Siberia

By G. T. Eve, O.B.E., M.C., Assoc.Inst.M.M.

THE SELEMDJA REGION.—The total length of the Selemdja River is over 400 miles, of which about 330 miles are navigable. The current is very rapid, and in many places exceeds 12 miles per hour when in flood. There are many rapids, especially in the upper reaches. Up to about the mouth of the Nora River barges can be towed up. Higher up, as far as Ekimchan shallow draft (2-ft.) steamers only can navigate and these not always. The valley of the Selemdja is wide. Even in the upper part, where high hills bound it on both sides, the valley often reaches a width of more than a mile. As the river is swift and broad and has a considerable fall, the volume of alluvials which have been and are still in process of being shifted is very considerable. The surface of erosion, past and present, is very great, considering the river's length. The number of large and small creeks assisting in erosion is very great.

The river flows through a timber country in which larch, fir, and pine are predominant. The river freezes in the middle or end of October, and the break-up usually occurs in the beginning of May.

GEOLOGY.—There are no rocks to be seen on the Zeya River on the way up between Blagoveschensk and the mouth of the Selemdja. The country is covered by recent alluvials, and the exposures of sand hills on the right bank are the most striking feature. The igneous rocks, granite, diorite, and diabase are seen from the mouth of the Selemdja upwards. Near the Ulma there appear gneisses and schist, having a north-west strike, and they disappear at the Nora. Between the Nora and the Myn, granite, porphyrite, and pegmatite are predominant. Between the Myn and Ekimchan the country is composed of schists with north-west strike, slates, sandstones, and limestones. Higher upstream granite is predominant. In the direction of the Kharga the country is composed mostly of schists with large bosses of granite. Further towards the Niman system we cross a granite massif of the Esop range with an extremely poorly developed contact with schists on both sides of the range. The Niman group, again, is composed of schists (with north-west strike), very frequently intersected by dykes of pegmatite, aplite, and diabase (?).

The general impression is that the country is composed of a wide belt of schists and gneisses striking in a north-west direction, intersected, broken through, and flanked chiefly by granite, and also in lesser degree by other igneous rocks which disappear further south under cover of sedimentary rocks. These latter are alluvials in the valleys, and Silurian, Jurassic, and Triassic elsewhere. The same belt stretches undoubtedly further N.W. and S.E. and passes through the central Zeya system on one side and through the lower system of the Amur on the other. In the Zeya system the amphibolite gneisses, and on the lower Amur metamorphosed schists are predominant.

ALLUVIAL GOLD MINING.—The belt referred to in the foregoing is the auriferous belt of the Amur Province. Where easiest of access it has been explored and exploited to a certain degree. Where difficult of access (as in the Upper Dep. Unya - Bom, which are left

affluents of the Bureya), it has remained scarcely scratched, unless it produced exceptionally rich gravels, as, for instance, in the Niman system. The reason of this lies not in any comparative poverty of the gravels of the districts untouched, but in the past history and in the method of development of Russian and gold-mining in Eastern Siberia.

Gold-bearing placers in Eastern Siberia have been known and worked for the last sixty years. The placers were found, studied, and worked mostly by the people of the country, by "snipers," by escaped convicts, by alcohol runners, and by small merchants. These people grew gradually or suddenly, as sometimes, happened, rich from the produce of their mines. They then formed companies, and thus, except in a very few cases, the mining grew and developed. The development was comparatively slow as is shown by the annual output.

Placer Gold Output, Amur Province and Maritime Province (Officially Registered).

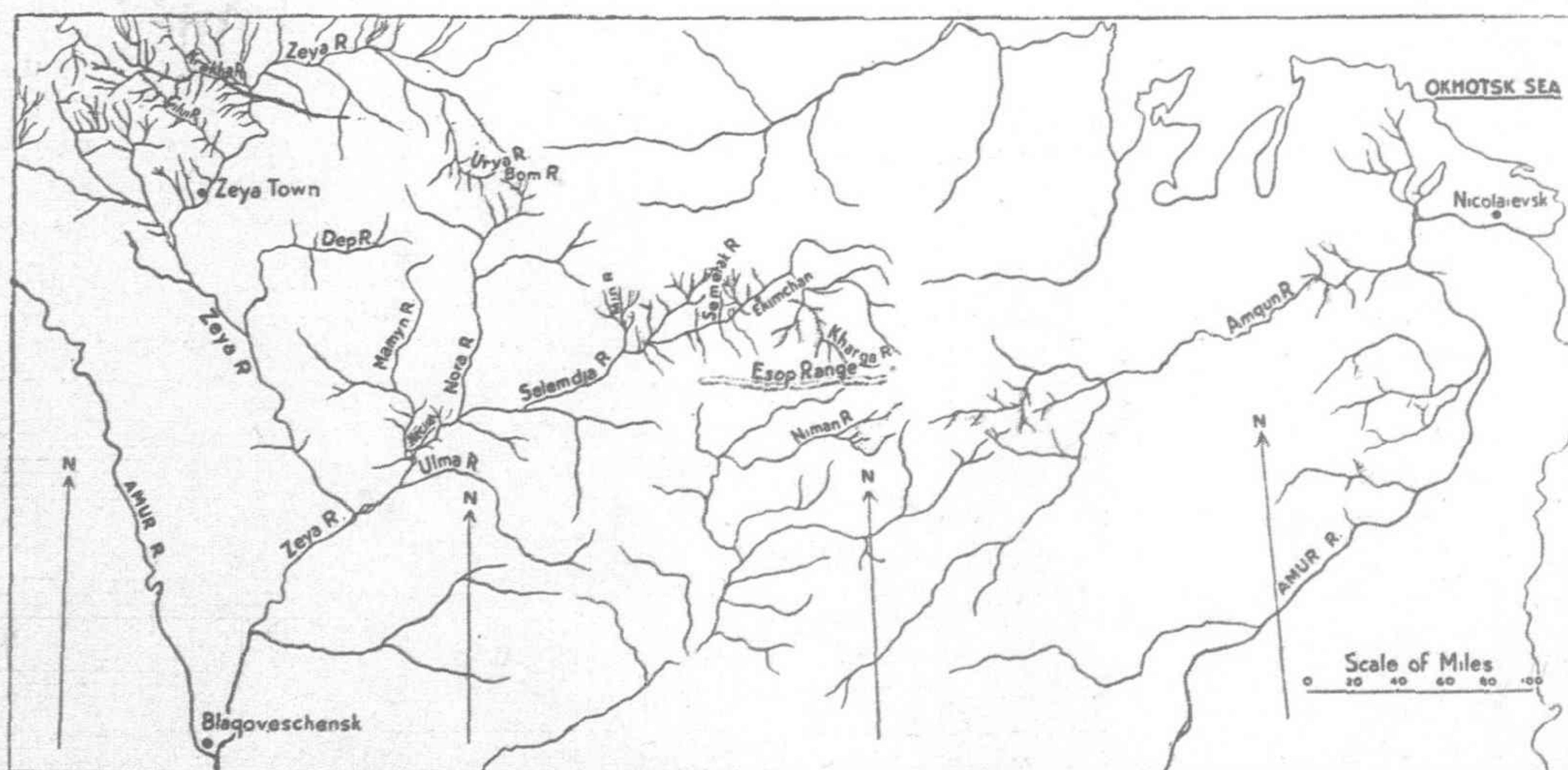
Years.	Oz.	Years.	Oz.
Up to 1868 ..	21,600	1908 ..	245,808
1869-79 ..	49,000	1909 ..	237,168
1880-89 ..	145,000	1910 ..	244,512
1890-1902 ..	216,000	1911 ..	218,160
1903 ..	216,000	1912 ..	289,648
1904 ..	174,528	1913 ..	177,984
1905 ..	197,856	1914 ..	130,032
1906 ..	206,496	1915 ..	100,088
1907 ..	310,608		

It is interesting to note that though the above figures are the official figures of the gold-mining output of Eastern Siberia, the actual amount of gold which passed through all gold-smelting laboratories is quite different and may be given as follows:—

Years.	Oz.	Years.	Oz.
1911 ..	459,648	1914 ..	530,064
1912 ..	444,096	1915 ..	422,084
1913 ..	476,064		

The explanation of this is to be found in the concealment of gold by the owners of the mines to avoid payment of royalties, also in the large amount of gold produced by unregistered "Snipers." To these figures must be added the gold smuggled over the frontier into China. In this way we can arrive only approximately at the true figure for gold produced yearly by Eastern Siberia. It was estimated by certain geologists and government officials that the real figure before the war was on an average about 650,000 oz. yearly.

With this figure in mind we can consider another factor, namely the number of mines and the way they worked. The total number of registered prospecting licences in Amur Province in 1915 was 5,742. The number of mining claims was 1,353, out of which number 441 claims only were under exploitation. These 441 claims were worked in the following way: By hydraulicking 2, by dredging 9, by properly run hand-labor 33, by tributers 397, total 441.



Map showing position of Gold Deposits in the Selemdja Region

This figure of 397 shows us exactly what type of mining we are really dealing with. The bulk of the gold was produced by handworking methods based on the tribute system. This was the natural result of the remark made above that the average citizen of the country developed mining by means of the gold taken out of the mines. The government offered very little help to the miners. Roads and means of communication had to be built by the miners themselves. In very many cases these men could neither read nor write. They started their mining without capital. In such a country it is natural to expect the predominant system of mine-development to be the crudest and the simplest. Such was the case in Eastern Siberia.

Naturally, also, we can expect to see in such a case only the richest, best situated, and most easily accessible mines tackled first. Such, again, was the case in Siberia.

The Russians in their search for gold naturally went up the creeks first. The creeks, with their shallow gravels and facilities for diversion of water, presented the best mining grounds for the Russian gold-mining in Eastern Siberia remained until it was ended by the revolution. Any ground presenting water difficulties, or generally speaking, any ground unfavorable for hand-working methods was left over, mostly untouched.

The tributing system applied to such ground was an expensive one. The men used to steal from 25 per cent. and upwards of the gold won, and not less than another 25 per cent. of the gold was lost through imperfect means of working the gravel. The following statement shows us what kind of mines could be tackled successfully by the Russian miners of the time. In 1915 0.03 per cent. of the total working mines had gold contents below gold \$1.25 per cu. yd.; 15.25 per cent. had gold contents from \$1.25 to \$2.50; 68.21 per cent. from \$2.50 to \$5.00; and 16.50 per cent. \$5.00 or over.

The Russian statistics give gold values always for the pay-streak only, without any reference to the overburden. To our knowledge the overburden of the country in question is on an average from two-thirds to one-third of the total depth. Thus, the minimum average value the Russians could and would work on was about 40 cents per cu. yd. And that minimum according to all available data known to me remained until the revolution.

This figure of 40 cents gold per cu. yd. is naturally very high. It depended on two factors: (1) Imperfect and primitive methods of working the placers; (2) high cost of transport. The imperfect and primitive methods of working were due to the absence of properly trained engineers, a result of the ignorance and want of education prevalent among the owners of the mines. Lack of capital necessary to bring mining beyond the stage of manual labor had something to do with it also. Even such a company as the Upper Amur Co., which employed thousands of men, sometimes had only one engineer in charge, sometimes none at all.

I repeat that the methods of working were very primitive and simple. The following was usually the *modus operandi*. After diversion of the creek by means of a newly dug channel, the overburden would be taken off by hand work and carted away on horse or hand-carts. Then the paystreak would be attacked by means of an open-cut, the gravels being carted away in horse or hand-carts down to the washing-plant. The washing-plant consisted of a high platform (this necessitated lifting off the gravel again) from which the gravel was dumped into a huge revolving screen. The oversize was carted to the dump. The undersize was run over short (about 15-ft.), steeply inclined (about 25 per cent.) sluices, and worked through and away to another dump. No riffles were used. As a result most of the dumps contain no less than 10 cents gold per cu. yd.

The above-described plants were used only among (and not on all) the thirty-three claims referred to above. The rest of the 397 claims had not even that. In their case the gravel would be taken away from the open-cut and worked in small short toms,

each of which was padlocked and put in charge of a certain number of men. No pumps were used, and everything was done by hand. Such was the general method of placer mining in Eastern Siberia during the summer season.

The winter season was usually used for prospecting (pits, freezing, or thawing through, as the case might be), or underground work if the placers were sufficiently rich and could not be worked for various reasons (water, depth of the gravels, etc.) in summer. The last method of underground mining was simply glorified pig-rooting and nothing else. Even the Czarist Russian government recognized the damage such mining was doing, and tried to stamp it out, for only about 30 per cent. of the gold was taken out of the placers.

Hydraulicking is a new method in the field. It was tried the first time and with great success during the war. Dredging was introduced into the Amur Province in 1909, when an enterprising rich miner and merchant bought two 5 cu. yd. open-connected dredges and navigated them for about two years on the Zeya and Selemdja Rivers, testing the ground now and again on the look out for suitable gravel. Eventually he struck ground which paid the expenses of one dredge in the first year's work. Later, on a saner basis of work, it was proved that dredging costs could be reduced to from 8 to 14 cents gold per cu. yd.

In 1922-3 I saw four of the dredges. Two of them were panting painfully and slowly. They were dirty, half broken down, and an eyesore. Of the other two there was nothing but the pontoons left; nothing else was visible.

The greatest obstacle to Russian mining in Eastern Siberia was transport. Long distances, absence of roads, bad organization of river transport, all had a very bad influence on the development of mining at that time. Those were the conditions before the revolution. Since the revolution matters have become still worse. The usual freights on the Amur river were from about 0.64 cents Mexican per ton per verst (1 verst = $\frac{2}{3}$ mile) up to 1.05 cents. But on certain affluents of the Upper Selemdja they reached sometimes the formidable figure of 20 cents Mexican per ton per verst. Winter transport on horse sleighs was still more expensive. It started from 20 cents Mexican per ton per verst, and sometimes reached the figure of \$1.20.

One of the dredges referred to above cost \$100,000 Mexican, landed in Blagoveschensk. But the transport of this dredge up to the mine on the Upper Selemdja, the last stage from Ekimcham upstream, was done during the winter on sleighs, cost about another \$100,000.

The Amur merchant fleet was of considerable size. It consisted in 1917 of 252 steamers having a total cargo capacity of about 21,860 tons, and of 277 barges having a total cargo capacity of about 113,000 tons. In 1921 only 156 steamers and 128 barges were left. Adaptation of steamers to the local conditions of rapid shallow streams on the tributaries of the Amur is no easy matter. In this matter the steamers failed very badly.

I see no reason why, with an improved type of steamer such, for instance, as those in use in Alaska, and extensive use of mechanical transport in summer and winter, the transport costs should not be lowered considerably, especially if certain lessons learnt during the war be taken into consideration.

Summing up all the factors affecting mining in East Siberia, it is easy to see why in the past the Russian mines could work only rich and easy ground.

If we now consider the Selemdja alluvial goldfields, we shall find exactly the same picture. Creeks which were rich, shallow, and easy to get at, are mostly worked out. The interior of the basin, away from more or less big tributaries, has been left practically unexplored. The larger creeks and flats of the streams, though known to contain good gold, have been left untouched. Creeks or terraces with 20 to 25 cents gold per cu. yd. were not worked at all.

It is interesting to note that of the total



Map of Eastern Siberia, Showing position of the Selemdja Region

area of the Amur and Maritime Provinces (amounting to 824,500 sq. versts), 11.80 per cent. has been more or less surveyed by the geologists: 47.08 per cent. were only visited on route marches, 41.12 per cent. were not visited at all.

THE DEPOSITS.—The first mining of alluvial deposits on the Selemdja begins from the mouth of the Mamyn. Here we find quite a number of small creeks, tributaries of the Selemdja, which gave excellent placers, the Neclia and Korolevsky mines, for instance. The peculiarity of the group is the rather unusual depth of the gravels, exceeding sometimes 30-ft. to the bedrock. The result was that extensive flats at the mouth of the creeks were left untouched. The gravels contain little or no clay, no boulders, and are unfrozen. The overburden consists mostly of tundra. The gold is coarse, and heavy, and is mostly concentrated near bedrock (soft, decomposed gneisses and schists), but, on the whole, as everywhere in the Selemdja basin, the gold is pretty evenly though comparatively poorly distributed through the depth of the gravels, with special concentration near bedrock. These phenomena were usually disregarded by the Russian miners.

This first mining field extends upstream to the mouth of the Nora. The yearly output of the group before the revolution was about 19,440 oz. of gold of about 860-880 fineness. The Upper Mamyn, though known to be auriferous, was left untouched. The Upper Nora, extremely difficult of access, is very little investigated, though the rich Unya-Bom system is in evidence there. This last field, situated so far away in the taiga (forests) among high hills, was the scene of many bloody crimes, risings, sudden disappearances, and appallingly arduous conditions of work. The gold, so far as I could ascertain (that system was not visited by me) is of very patchy character, mostly nuggets in shallow coarse gravels.

From Nora upwards, until we get to the Lower Myn, we have apparently a break. Apparently, I say, as nobody has investigated the valley of the Selemdja itself yet.

From the Lower Myn begins the Upper Selemdja mining group, a veritable paradise for the Russian miner. Hundreds of small creeks, rich in heavy gold found in shallow gravels close to the main navigable river, constituted ideal ground, and the Russians made the most of such a golden opportunity. The great majority of the creeks are worked out now, but the valleys of the larger streams and of the Selemdja itself are still little touched. The total output of this field up to 1917 was 604,800 oz. of gold of slightly lower fineness than that of the Lower Selemdja system. Here was a field with creeks of exceptionally high values. The creeks Aldyn and Dagalyn for instance, now worked out, produced from \$2 to \$4 gold per cu. yd. This was the site of the first successful attempt to start dredging in Eastern Siberia.

I have mentioned these dredges already, and the state to which they are reduced now. Since the revolution one new dredge was added. It is a small (2½ cu. ft.), close-connected American dredge, which belongs to an American-Belgian-British company. They have worked for the last two years, with apparent success, in the valley of the River Semertack, a right affluent of the Upper Selemdja. The depth of the placers is that usual for the Upper Selemdja, about 14 to 15-ft. The values were, so I was told, from 30 to 70 cents gold per cu. yd. The company is conducted and backed apparently by plucky pioneers of the old sort, who defied all adverse opinions. They have my sincere wishes for success.

Two of the features of the mining fields of the Upper Selemdja are worth mentioning. One is the presence of patches of frozen ground; another is the presence of extensive alluvial terraces. The influence of the first is known to any miner who has worked up North. The second is worth looking into, especially in a country like the Upper Selemdja, where water and timber are abundant and grade is good.

After the Upper Selemdja comes the Niman system separated from the first by the high and wild Esop range. This group is situated on the Upper Bureya, an affluent of the Amur. It is worked out and is now of no interest. It was rich and produced about 800,000 oz. of gold.

CONCLUSION.—The present state of mining is not difficult to describe. The larger companies are gone and no large-scale mining is in progress. A few small enterprises are at work, some conducted by individuals, some by the workmen themselves. No new system of work has been introduced, no new placer field has been discovered. Quite a number of "snipers" are working all over the country.

The country has to start afresh, and there is no capital available in the country to conduct mining. It was comparatively easy

to start before; there were so many rich and accessible mines. There are only few such now left. The country will have to start work on poorer deposits, but that will mean a revolution in the mining methods. It will mean the introduction of mechanical appliances, of skill, of up-to-date knowledge of mining. And that will mean the introduction of extensive foreign capital also, for there is little money in the country itself.

One more important feature in connexion with the Selemdja placers is to be noted. I have visited many placers situated on the creeks of the region in question. Practically all of them are undoubtedly detrital placers. Therefore, a question immediately arises: what about reefs? The Russians were aware of this problem. They thought about it, they spoke about it, they wrote about it, and did practically nothing. It required capital, skill, patience, knowledge. Why should people waste all that, even if they had it, when gold was so easy to be won without it? Nevertheless, there are reefs, there are quite pronounced zones of impregnations which give good values. There are large areas containing them. But all that belongs to the future.

The Electricity Supply of Shanghai

(Continued from page 613).

Summary of Substation Work

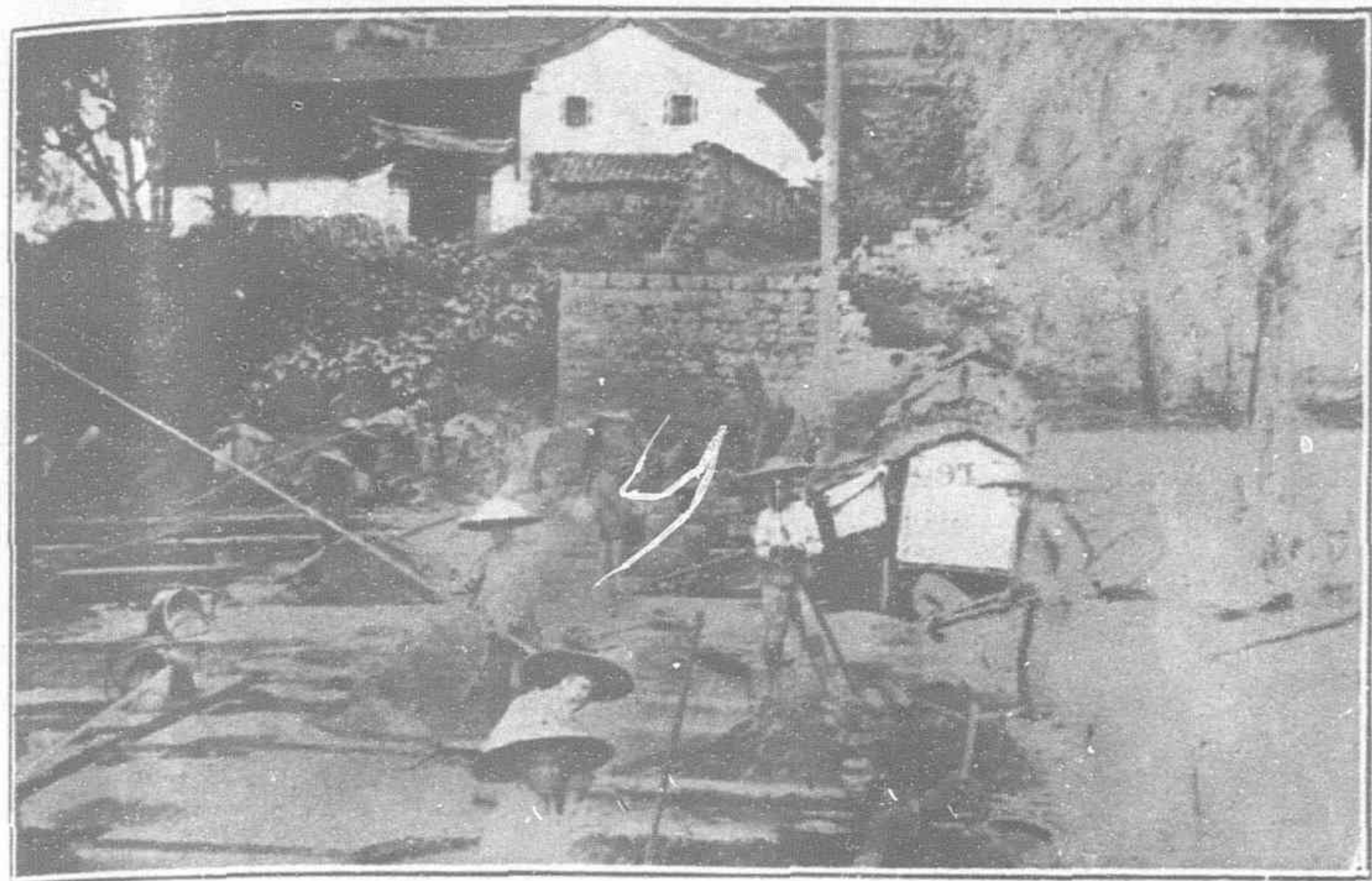
	Number.	Capacity K.V.A.
Transformers installed in 1924 ..	82	105,237
" dismantled in 1924 ..	24	35,275
Nett increase for year ..	58	69,962
Substations commissioned in 1924 ..	19	
" dismantled in 1924 ..	3	
Nett increase for year ..	16	
Pole Transformers erected in 1924 ..	20	
" " dismantled in 1924 ..	0	
Nett increase for year ..	20	

Power

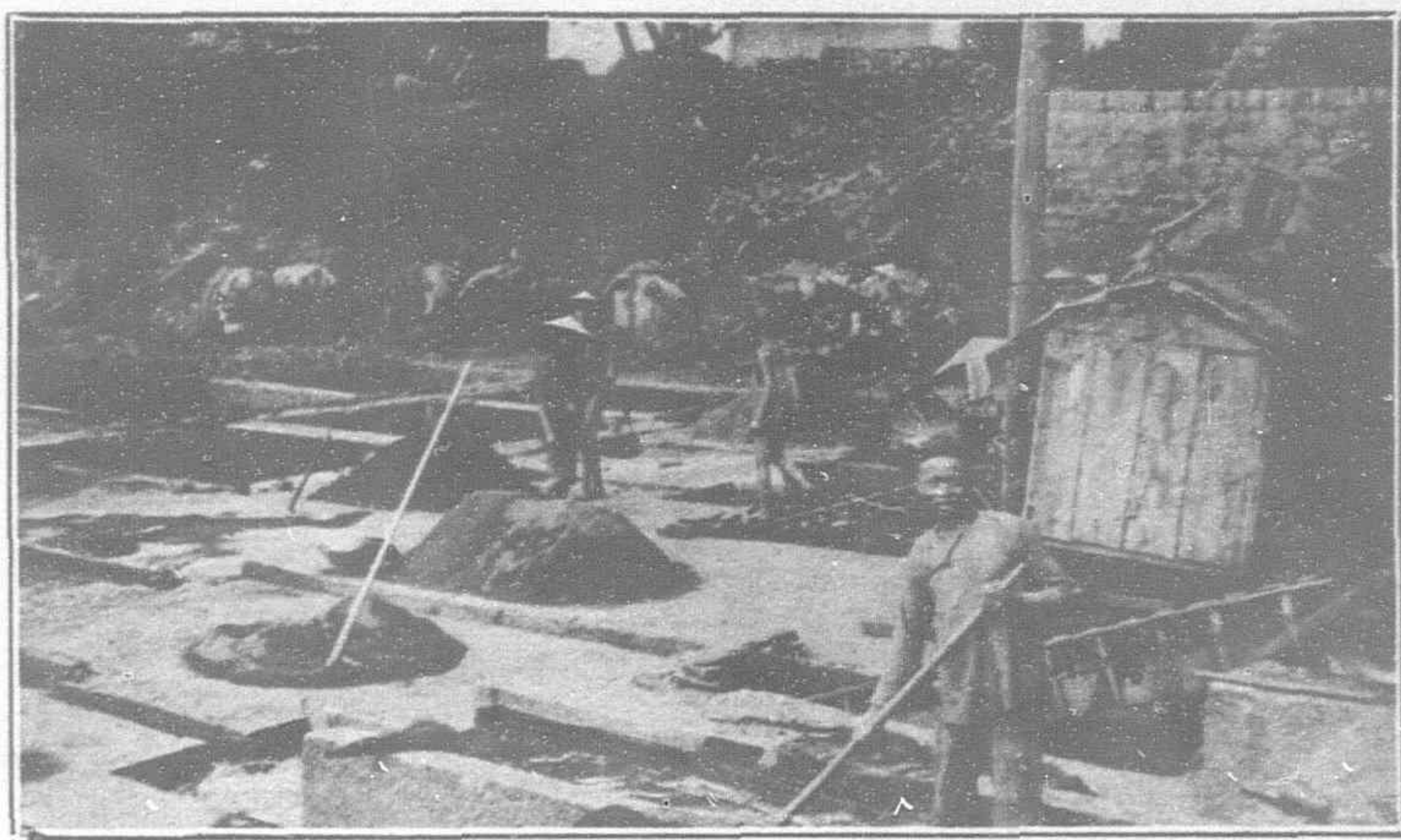
	Number.	Horse power.
Hired Motors disconnected during 1924 ..	59	62
Consumers' Motors connected during 1924 ..	536	8,326
Nett total increase for year after deductions in respect of disconnections ..	477	8,388
Total Hired Motors connected at December 1924 ..	781	17,436
Total Consumers Motors connected at December 1924 ..	4,172	85,761
Total Lift and other Direct Current Motors connected at December 1924 ..	327	6,596
	5,280	109,793

The industrial outlook at the commencement of the year covered by this Report did not justify optimism, and the subsequent fighting in the vicinity of Shanghai further dimmed any hope of the maintenance of past records so far as increase in motors connected was concerned. This state of affairs is indicated by the addition of 7,293 horse power in motors connected during the year, which does not approach the increases recorded during the two preceding years.

The decrease in the number of Direct Current Motors connected seems to indicate that the advantages of Alternating Current supply for the operation of hoists and lifts have at last been recognised, such advantages including supply at one third of the cost of Direct Current, and also frequently lower capital and maintenance costs.



Washing Tin Ore in the Compound of the Kochiu Tin Trading Co.



Washing Tin Ore

China's Tin Industry

By Philip R. Wolff

THE chief sources of tin production in China are:—

		Tons.
Yunnan, approx. annual output	..	8,000
Kwangsi " " "	..	5/600
Hunan " " "	..	150/200

Kochiu is the principal place in Yunnan where tin is mined, the metal being obtained in a very primitive manner, no machinery being employed. There is in the vicinity one fairly modern smelting plant which was erected by a European firm at a cost of over \$1,000,000, but it is reported that the output averages only about 500 tons per annum.

The tin is smelted in Yunnan in slabs of about 55 catties each (1 catty equals 1 1-3 lbs) and contains anything from 50 per cent. to 90 per cent. tin, according to the mine from which it is produced.

Refining

Practically the whole of the output comes to Hongkong, where there are about six refineries. The slabs are remelted in open circular saucer-shaped iron pans 39-in. in diameter by 12½-in. at the deepest part. In the centre of the pan is placed a cylinder 12-in. high, 15-in. diameter, made of ⅝-in. iron, so that at the actual point of contact the cylinder rests on a knife edge only. This, apparently, is a most important factor in the melting process.

Wood is used as fuel; some slag from previous melting is left around the cylinder, the various grades of slab tin are placed on end around the cylinder, and as it gradually melts the pure tin finds its way by gravity into the cylinder via the knife edge, and thence the molten liquid is ladled out into either iron or loam moulds. The scum on the molten metal outside the cylinder is skimmed off at frequent intervals and removed to separate moulds. This slag, which contains as much as 70 per cent. of tin, is made

into rough bricks and is reserved for further refining with charcoal by forced draft during periods of slackness. The residue from these "bricks" is called "iron tailings," and contains as much as 30-35 per cent. of tin. These tailings are disposed of to Europe and North China principally, no attempt being made in Hongkong to recover the tin contents.

Purity Tests

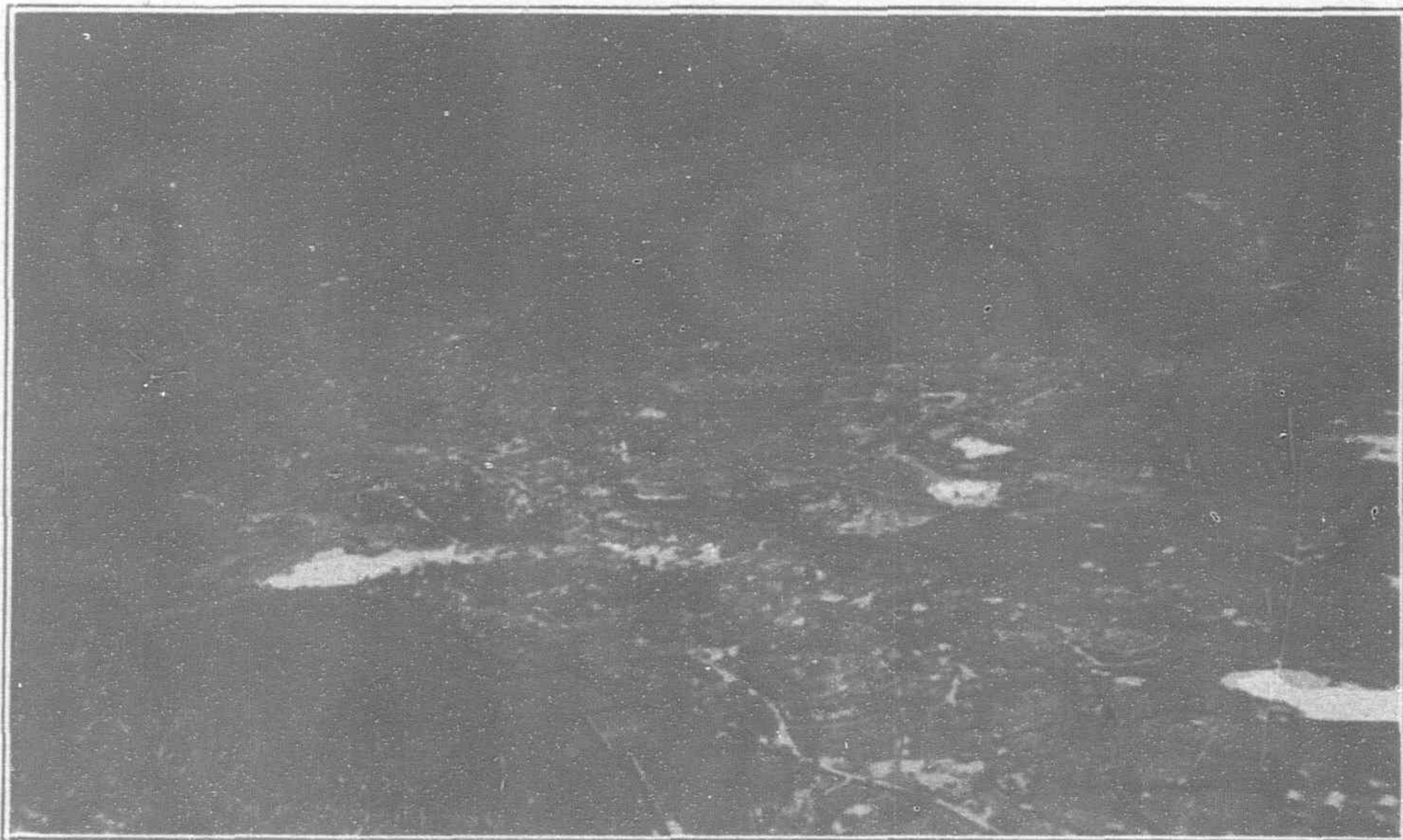
During the melting of the metal, frequent tests are made to ascertain that the standard of purity desired is being maintained. This is done by pouring a little of the molten metal, about the size of a crown, on to a sheet of paper placed on the bottom of an inverted earthenware pot. The "sheen" and the pattern of the surface of the disc so obtained afford the requisite guide for the purity test. Should the charge show signs of falling below the required purity, more slabs of tin of high purity, such as Straits, Banca, or Ho Yuen (Kwangsi) 99.8 per cent. to 100 per cent., are added to "sweeten" or improve the quality.

The capacity of each refinery, for a working day of 16 hours, is about 25 tons.

The method of arriving at the prices at which the various grades may be sold is based on the prices of the various grades of rough, plus melting charges. These charges depend greatly upon the cost of fuel and vary between \$8.20 and \$3.50 per picul (1 picul equals 133½ lbs).

The tin from Kwangsi and Southern Hunan, being of exceptional purity (sometimes as high as 99.9 per cent.), is used principally for "sweetening" the Yunnan tin which is being refined.

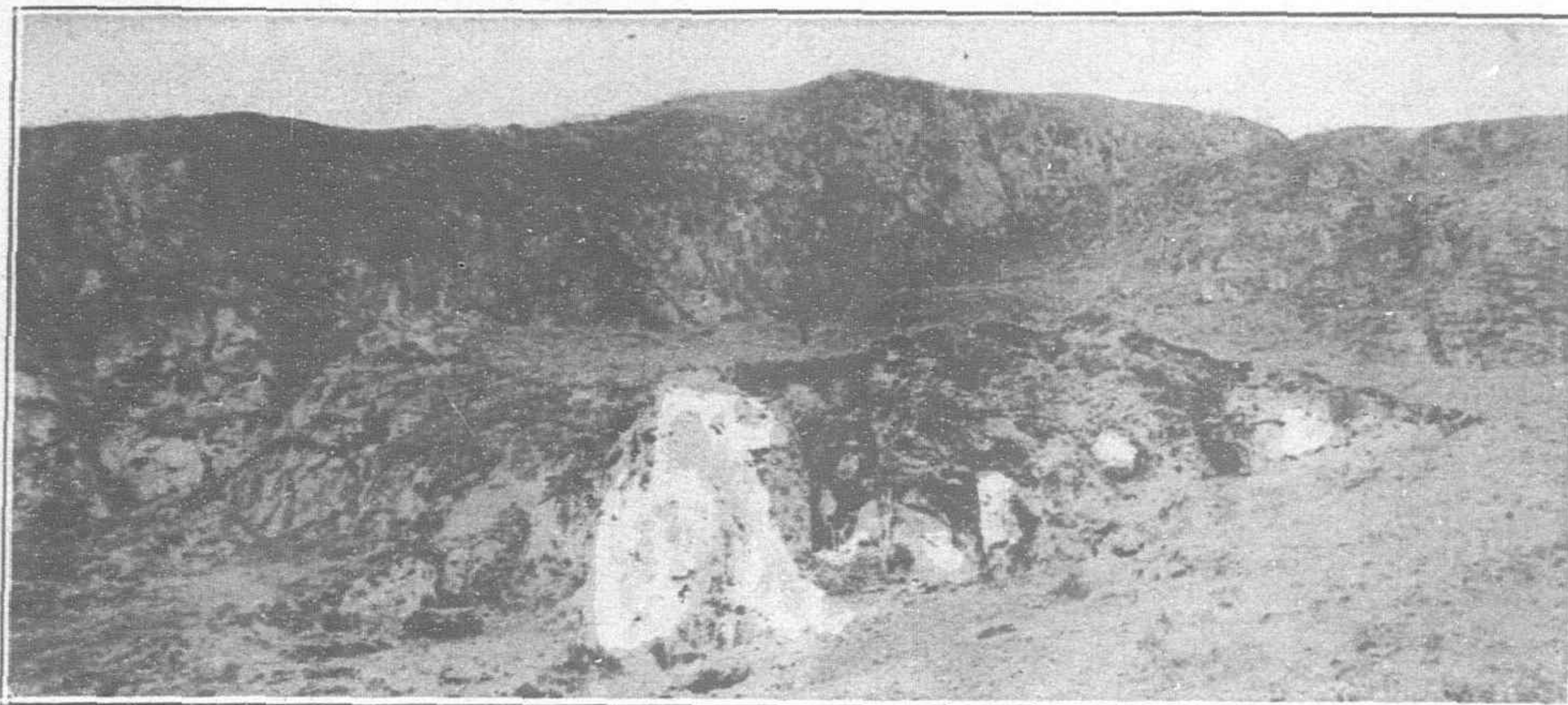
In addition to the mined tin a fair quantity is recovered from burnt joss-paper ashes, cigarette and other tinfoil wrappers. No detinning works exist in China.



General View of Kochiu City, Yunnan Province, the Centre of the Largest Tin Mining Industry in China

Accurate Grading

The refining is in charge of foremen who must have had many years' experience before being entrusted with the work, because upon their acuteness, keen observation and judgment depend the correct grading of the tin. From long experience and intimate knowledge of the different grades (the percentage of tin in slabs from each Yunnan smelter, whose brand or "chop" is on each slab, being more or less known) these smelters know how much of each grade is necessary to produce refined tin of 96 per cent., 98 per cent. and 99 per cent. respectively. No assayers or analysts are employed in these refineries, all results being judged solely by observation. The foremen claim that while an analyst may be wrong at times, when analysing No. 1 grade, they never are. But they admit that occasionally, when they have been overworked, mistakes occur with the No.

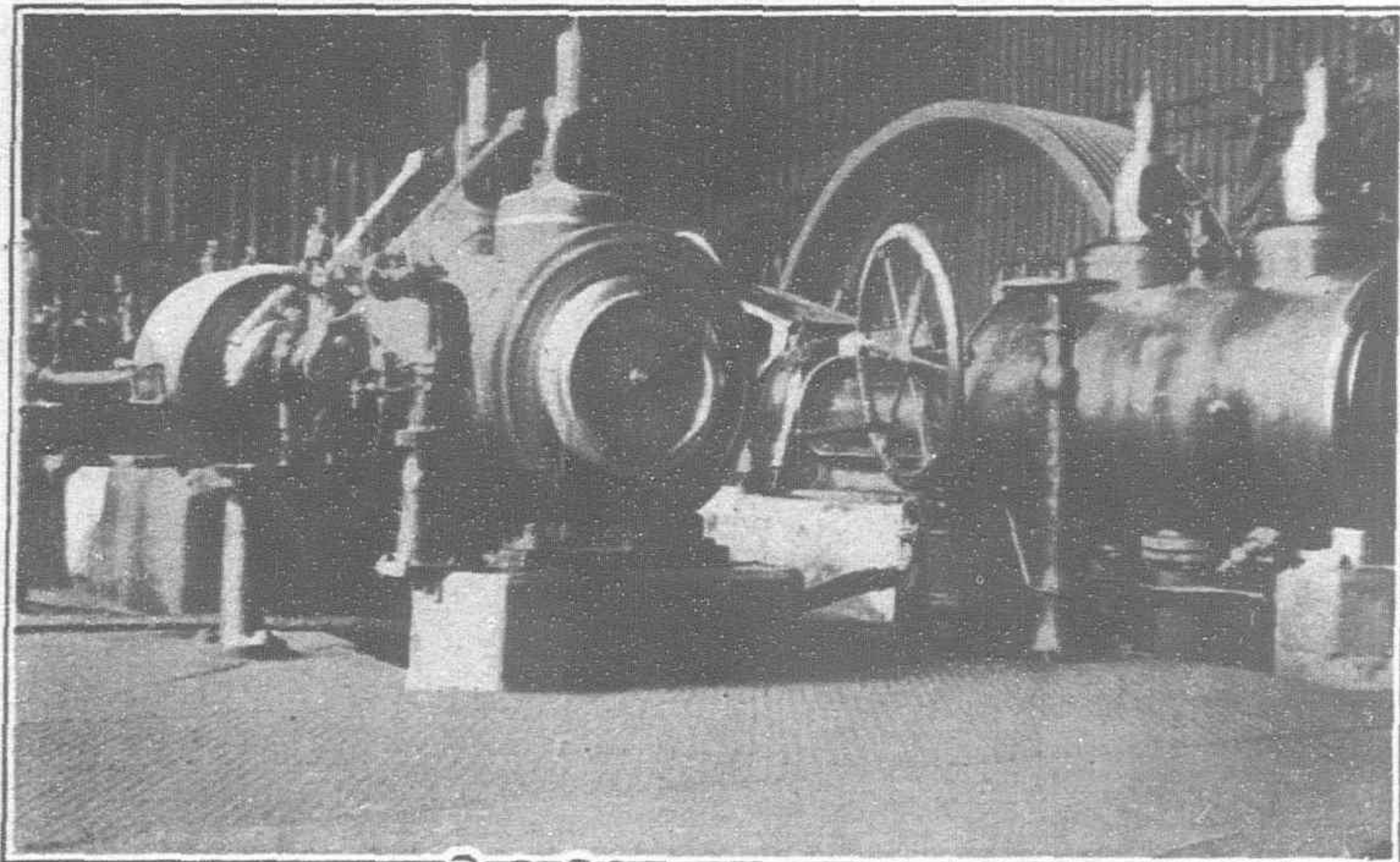


One of the Tin Mines Located 10 Miles from Kochiu

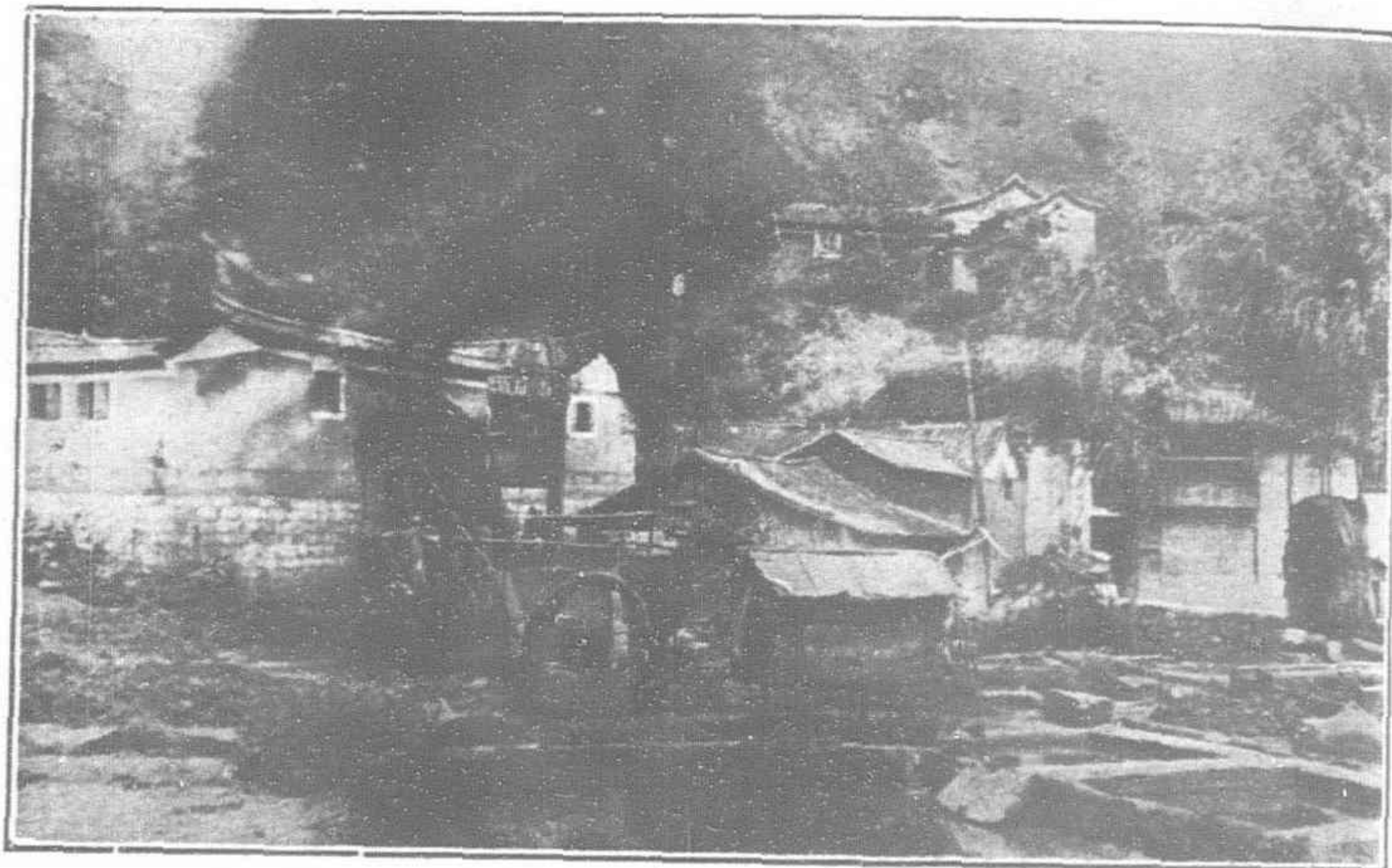
3 or 96 per cent. grade, more especially when their margin of profit is infinitesimal, and they endeavour to cut the percentage too fine in order to save mixing too much high grade tin. With the No. 1 they can almost invariably tell, to a decimal point, the purity of the metal they are turning out.

The chief places to which the various grades are exported are as follows:—

No. 1 minimum	...	...	99%	To foreign countries, the bulk going to the United States.
No. 2	..	...	98%	
No. 3	..	...	96%	
"Kap" slabs	...	...	99.5%	To Swatow.
"Dow" ingots	...	...	99.5%	
"Dow" slabs	...	...	98%	To Amoy and Foochow.
"Kwa Hung" No. 3 pigs,	slightly under 96%—To Shanghai and North China.			



German Power Plant at the Kochiu Smelter



Tin Ore Washing Troughs

New British Launchings for the Oriental Trade

On February 6 there was launched from the Cartsburn Dockyard of Messrs. Scotts' Shipbuilding & Engineering Co., Ltd., the single-screw geared turbine passenger and cargo steamer *Anking*, which has been built to the order of the China Navigation Company for their Bangkok, Hongkong and Swatow service. The dimensions of the vessel are:—350-ft. long overall, by 49-ft. breadth, by 34-ft. deep; and the gross tonnage will be about 3,700 tons.

The vessel is of the awning deck type, with two complete 'tween decks for third-class passengers, while a large deck has been arranged under the promenade deck suitable for 25 first-class Chinese passengers. Accommodation for six European passengers as well as the officers has been provided on the promenade deck. The ship is up to the highest British standard for passenger carrying, including turning-out gear, boat davits, etc. The boilers are fired by oil fuel, and a speed on service of about 13 knots will be attained. The steamer will be driven by a single screw, actuated by double reduction geared turbine of the Brown-Curtis type. Super-heated steam will be provided by three double-ended cylindrical boilers working under Howden's system of forced draught, at a pressure of 220 lbs. per square inch, and arranged to burn oil fuel. The machinery is designed to give a shaft horsepower on service of 2,300, with a propeller running at 90 revolutions per minute.

Federated Malay States Railways

In a speech introducing the Supply Bill to the Federal Council on November 25, the chief secretary to the Federated Malay States Government outlined the railway programme for the coming year. He stated that economic considerations demanded the expenditure of a considerable sum of money on the extension of the Eastern Branch of the railway through Pahang and Kelantan. An expenditure of 3 million dollars for work from the northern (Kelantan) end and of a million dollars from the southern (Pahang) end was asked for, and was recommended. With the approval of these allocations, the Pahang section should be completed during this year, without further cost, and on an estimated additional expenditure of 4 million dollars in 1926 and 2,800,000 dollars in 1927, the Kelantan section should be completed in the latter year.

Apart from railway construction in Pahang and Kelantan the work of the construction branch is to be confined to the completion of schemes already in hand. Special services on the open-line account amount to \$867,000, and that figure has been arrived at after the most careful scrutiny of the department's requirements.

During the first half of the current year, the railway receipts showed a 13 per cent. increase over the corresponding figures for 1922, owing largely to the operation of the revised goods rates introduced on January 10, 1924. A general reduction in passenger fares came into operation on July 1, 1924.

History of Bamboo Steel

By Wong Kok-shan

THE history of Bamboo Steel dates as far back as the first importation of foreign steel into China. The importation of foreign iron and steel first figured in the Customs Returns in 1859, *i.e.* 16 years after the port of Shanghai was opened to international commerce, while Bamboo Steel was only first separately classified in the returns for 1903. But it is traditionally known that Bamboo Steel preceded the coming of Mild Steel and came only a few years after Wrought Iron and Nail Rod Iron, and that it has been in circulation in the market for the past 50 years. So the probability is that it was first introduced into China in the neighborhood 1875 or even earlier.

It is interesting to trace the origin of the shape of the Bamboo Steel, which, from its corrugations, gave rise to the appellation of "Bamboo." In the advance of metallurgy from wrought iron to steel about 60 years ago, the first attempt in manufacturing steel was in the Rhine region in Germany. It was made in small shops by water power and hand forging, which accounted for the corrugations. To make the quality distinctive from Wrought Iron, the steel was made hard and brittle by higher carbon content and heat treatment. Such steel was first exported to China and the Balkan States. In China it found ready favor, and by reason of the corrugations or ribs it was given the name of "Bamboo," which has ever since been adopted even in the Balkan States. While the corrugations and heat treatment have no technical value, the form and brittleness, which have given currency to the brand and by which its commercial value is appraised in the market, have to be retained, thus what could not be got rid of from the start by forced of circumstances have perforce to be perpetuated by means of special rolls and machines involving unnecessarily extra expense. The highest grade of Bamboo Steel is without "water cracks" being more homogeneous in structure, but as this would cost £2 more to manufacture, the grade that is exported is of the second grade with "water cracks." Another kind of steel made in Germany, similar to Bamboo Steel but without corrugations and heat treatment and softer in quality, is Schweiss Stahl (Welding Steel), which is only exported to Turkey.

The first importation of malleable iron into China was Wrought Iron of only a few shapes, such as iron plates and nail rod iron, while such shapes as round square and flat bars were not imported then. At that time native smelters in Hunan made a sort of wrought iron bars of about 2 inches square by 6 inches long and shipped in bundles of 20 bars. Such bars were very malleable and could be forged into very thin bars without cracking, but they could not be made into knives. The edge of the knife was, therefore, supplied by Bamboo Steel, which had a higher carbon content than Wrought Iron and was hard and brittle. The manner of making a knife was to first take a piece of Bamboo Steel and hammer it to about $\frac{5}{8}$ -in. wide and $\frac{1}{4}$ -in. thick, which would then be inserted into the edge of the piece of wrought iron intended for the blade of the knife. The same would be welded and hammered until the edge of blade with the pieces of Bamboo Steel getting very thin. The sizes of the Bamboo Steel used vary according to the sizes and kind of tools to be made, such as crow-bars, axes, knives, farming implements, etc.

In the earlier days the "Double Horse" brand imported from Germany was not popular in this market, which were sold at about Tls. 5.00 per case. The quantity imported during the first few years was no less than from 40,000 to 50,000 cases a year. After a few years the "Deer" brand and the "Double Deer" brand gradually came into the market, which were then selling at a lower price than the "Double Horse" brand, but the quality was in no way inferior to the "Double Horse" brand. Consequently the two new brands gradually displaced the "Double Horse" brand in this market.

During the Great War the source of supply was cut off as no shipment could be made from Germany. Towards the end of the

war an American firm Messrs. Thomas Simmons Company produced on the China market a brand of American Bamboo Steel known as "Ship" brand, selling at that time at about Tls. 10.00 per case. The total quantity sold was over 10,000 cases. This was afterwards followed by Robert Grant, who sold in 1920 and 1921—27,000 cases of Bamboo Steel in Shanghai, Hongkong, Bangkok, Singapore and Manila. However, as the American Bamboo Steel were afterwards being shipped in very thin wooden cases with very poor packing, which was different from those of former shipments, the dealers began to lose faith in the quality of the steel.

The only American manufacturers who are still making Bamboo Steel and importing them into China are the United States Steel Products Co., and from their general catalogue the following statement may be quoted, as showing the standard sizes and standard mode of packing:—

"This product is extensively used in China, Japan, the Phillippine Islands and the Dutch East Indies for a large variety of purposes, including the making of wood-working tools, razors harvesting knives for hemp, tobacco, sugar cane, etc., and other implements. It is usually furnished in the following sizes:

Round and Square bars $\frac{3}{8}$ -in. to 2 $\frac{1}{2}$ -in. inclusive.

Flat bars, with either round or square edges: 1-in. by $\frac{1}{4}$ -in. 1 $\frac{1}{4}$ -in. by $\frac{1}{4}$ -in., 1 $\frac{1}{2}$ -in. by $\frac{5}{16}$ -in., 1 $\frac{3}{4}$ -in. by $\frac{5}{16}$ -in., 1 $\frac{3}{8}$ -in. by $\frac{3}{8}$ -in. 1 $\frac{1}{2}$ -in. by $\frac{3}{8}$ -in., 1 $\frac{3}{4}$ -in. by $\frac{3}{8}$ -in.

Other sizes may, however, be submitted for our consideration.

In ordering Flat Bamboo Steel with round edges, state whether the width mentioned is measured over all or on the flat.

Our Bamboo Steel consists of plain smooth bars, without any lugs or corrugations.

It is usually furnished in strong wooden boxes made of wood 1-in. thick securely strapped to withstand the handling incidental to ocean shipment, containing 133 $\frac{1}{3}$ lbs. (1 picul) 80 lbs., 72 lbs., or 70 lbs., net weight, but boxes of other weight can be furnished if desired."

According to the above the United States Steel Products Co.'s Bamboo Steel is only in plain smooth bars, without any lugs or corrugations, but the proper trade name for such steel is not Bamboo Steel but Milano Steel, which is exclusively used in such places as Bangkok, Singapore and Manila. The chief distinguishing feature of Bamboo Steel from other kinds of hard steel or tool steel is the heat treatment, which gives high brittleness, the test demanded by the buyers. Such heat treatment requires a special plant, which is costly.

After the end of the Great War, the German "Deer" and "Double Deer" brands again returned to the market and soon resumed their former position.

The analyses of the German Bamboo Steel are given below:—

		Double Horse Brand	Double Deer Brand
Carbon	.. ..	0.57%	0.44%
Silicon	.. ..	0.15%	0.10%
Manganese	.. ..	0.78%	0.61%
Sulphur	.. ..	0.03%	0.05%
Phosphorus	.. ..	0.075%	0.085%
Chrome	.. ..	nil	nil
Nickel	.. ..	nil	nil
Tungsten	.. ..	nil	nil
Vanadium	.. ..	nil	nil

while another sample gives the following analysis:—

Carbon	.. ..	0.60 to 0.65%
Silicon	.. ..	0.15%
Manganese	.. ..	0.60 to 65%
Sulphur	.. ..	0.03%
Phosphorus	.. ..	0.05%

The Yellow Label Tool Steel as sold in the market here has the following analysis:—

Carbon	..	..	..	..	..	0.41%
Manganese	..	..	..	..	..	0.63%
Silicon	..	..	..	..	..	0.14%
Phosphorus	..	..	..	..	..	0.011%
Sulphur	..	..	..	..	..	0.011%

From the foregoing, it will be seen that as regards analysis, the Bamboo Steel is very much similar to Yellow Label Tool Steel, the only difference being the corrugations or ribs and the heat treatment as stated above.

It may be here remarked that attempts have been made in various countries to make Bamboo Steel, but none has been able to produce it as cheaply as Germany, where the business is controlled by a syndicate.

The following are the Customs Trade Returns for Importation of Bamboo Steel from 1918 to 1923.

Imported from	1918		1919		1920	
	Piculs	Val. Hk. Tls.	Piculs	Val. Hk. Tls.	Piculs	Val. Hk. Tls.
Hongkong...	12,072	211,046	9,402	106,047	13,027	149,128
Macao ...	9	211	23	138	25	279
French Indo-China	34	785	129	2,083	45	1,045
British India ...	21	495	—	—	119	3,242
Great Britain ...	152	2,587	22,287	176,365	19,832	158,165
Sweden ...	—	—	1,164	14,934	1,585	11,742
Denmark ...	—	—	1,873	24,031	—	—
Germany ...	—	—	—	—	3,200	37,118
Belgium ...	—	—	—	—	3,413	16,164
Russia and Siberia by land frontier	13	113	—	—	—	—
Russia Amur Ports	—	—	10	183	—	—
Russia Pacific Ports	—	—	2,940	42,085	2,493	29,247
Korea ...	108	2,254	92	1,905	4,211	38,317
Japan (including Formosa) ...	56,245	815,987	37,582	330,147	23,515	217,377
Philippine Islands	—	—	—	—	80	640
Canada ...	4,778	71,727	5,459	80,688	1,276	14,456
U. S. of America (including Hawaii) ...	121,422	1,513,207	101,787	783,566	63,339	466,556
Direct Gross Import ...	194,854	2,618,412	182,748	1,562,172	136,160	1,143,476
Re-exported Abroad ...	1,766	24,252	528	4,667	4,445	35,979
Total Net Import	193,088	2,594,160	182,220	1,557,505	131,715	1,107,497

	1921		1922		1923	
	Piculs	Val. Hk. Tls.	Piculs	Val. Hk. Tls.	Piculs	Val. Hk. Tls.
Hongkong...	10,060	86,731	6,074	49,520	6,483	51,009
Macao ...	49	479	34	289	10	56
French Indo-China	359	5,338	1,009	10,188	1,347	11,031
Singapore, Straits, etc. ...	21	223	13	67	—	—
British India ...	76	1,979	63	1,364	73	1,351
Great Britain ...	9,799	164,715	10,069	94,631	22,646	146,637
Sweden ...	130	2,299	523	14,778	1	7
Germany ...	3,511	29,028	9,768	62,341	14,636	89,511
Belgium ...	2,349	45,793	4,837	30,423	2,249	9,703
Italy ...	—	—	—	—	279	3,053
Korea ...	1,359	5,033	1,366	9,128	32	286
Japan (including Formosa) ...	21,783	168,319	4,162	41,349	17,169	141,682
Philippine Islands	7	128	1,132	4,983	222	677
U. S. of America (including Hawaii) ...	32,902	400,925	33,514	208,275	43,722	254,100
Direct Gross Import ...	82,405	910,990	72,564	527,336	108,869	709,103
Re-exported Abroad ...	1,133	11,261	1,284	5,927	380	2,243
Total Net Import	81,272	899,729	71,280	521,409	108,489	706,860

Launching of a New "Holt" Vessel for Far Eastern Trade

ONE of the most interesting launchings that has taken place for a very long time in England occurred at the end of May, when the *Prometheus* was launched from Scott's Shipbuilding and Engineering Company Ltd.'s. Cartburn Dockyard.

The vessel which is a twin screw oil-engined boat, was built to the order of Messrs. Alfred Holt & Company, of Liverpool, for their Far Eastern passenger and cargo services.

The launching of the *Prometheus* marks a new era in the development of ship construction, the outstanding feature being the adoption of a new kind of steel technically known as elastic limit steel. This, it may be remembered is the outcome of researches made by Mr. F. G. Martin, who is metallurgist to the owners.

Messrs. Holt & Co., have always been one of the foremost ship-owning firms in promoting developments likely to lead to improvements, and having realized the far-reaching effect of this material on ship design they decided to test its effect upon this vessel, and it will be of special interest in technical circles to learn that their efforts have resulted in a saving of fully 10 per cent. of the total steel material used.

The owners followed their usual procedure of deciding the scantlings themselves, and these were afterwards accepted for classification purposes by the British Corporation of Shipping and Lloyd's Register, and also by the Board of Trade in connection with the passenger certificate.

The vessel is of the poop, bridge, and fore-castle type, with a length of 425 feet between perpendiculars, a breadth of 54 feet 6 inches, a depth to the bulkhead deck of 32 feet 9 inches, and the gross tonnage is about 6,300 tons.

The equipment is of the highest standard, the cargo gear comprising eighteen electrically operated winches, and one of the derricks is suitable for 50 ton lifts.

All the requirements of the British Board of Trade for passenger carrying have been provided, including emergency dynamo, emergency electric bilge pump, boat turning-out gear, etc., and the weather decks are wood sheathed all fore and aft.

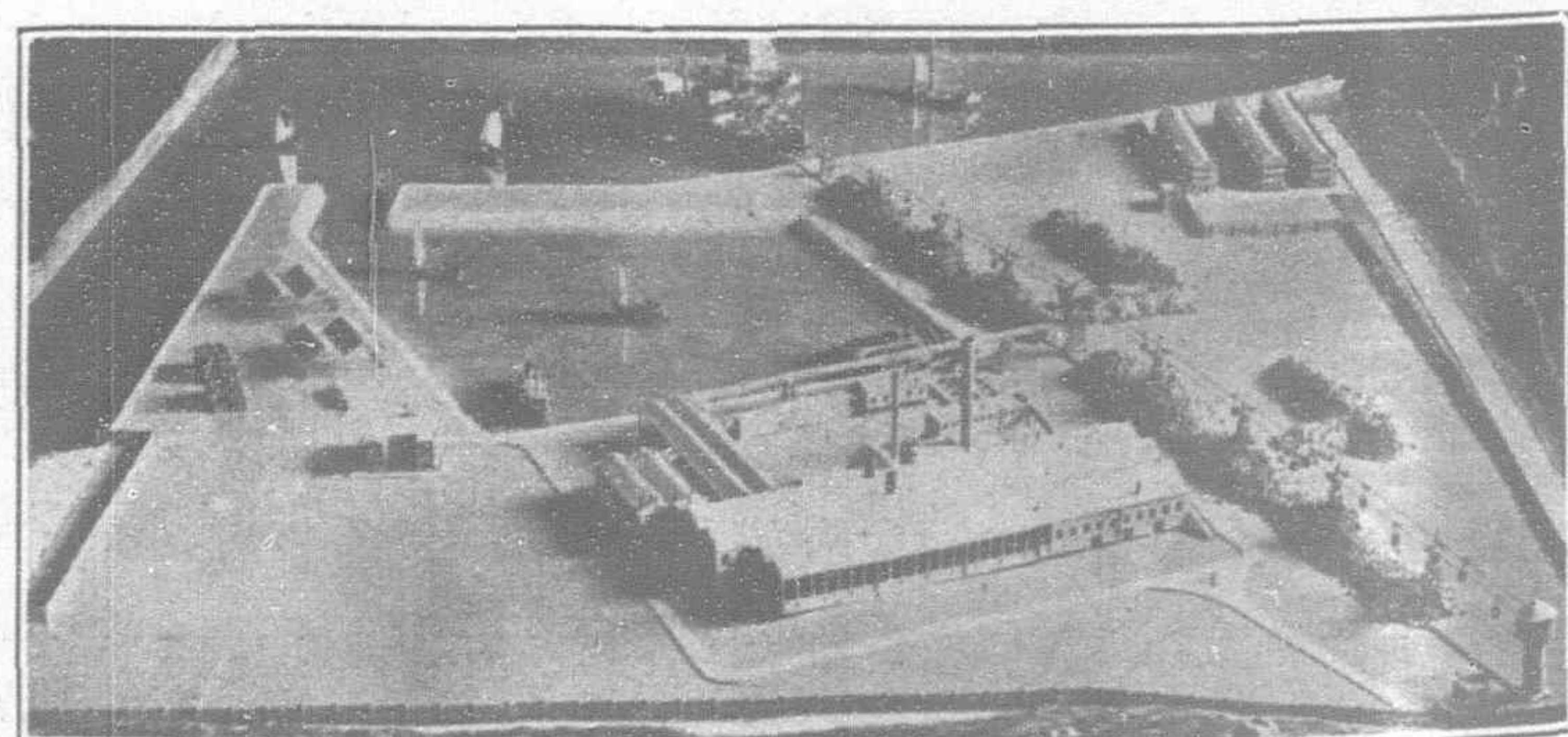
Messrs. Wailes Dove Bitumastic Ltd., have applied their Bitumastic enamel in peak tank, heels at bulkhead, under the sidelights and in the chain locker.

After the launch the vessel was berthed in the builders' wet basin, where two sets of eight-cylinder four stroke single acting Diesel engines of 3,700 b.h.p. will be installed.

Although this is the first of this type of vessel to be launched, the economies effected have encouraged the builders sufficiently to lay down another vessel on identically similar lines.

Green Island Model at Wembley

An interesting exhibit of the Hongkong Section at Wembley this year is an exact reproduction in miniature of the works the Green Island Cement Company propose to erect at Gin Drinkers' Bay. The model, made principally of zinc and sheet brass and enclosed in a handsome handcarved stand, with glass on all four sides, is the work of the Hongkong and Whampoa Dock Company. The buildings,—the fine offices, the factory, the clinker store and the Chinese staff quarters—as well as the 400 feet pier and the limestone conveyor, 1,600 feet in length, are depicted to scale and give a good idea of the magnitude of the undertaking.



Model of the proposed Gin Drinkers' Bay Works of the Green Island Cement Company

New P. & O. Steamers—"Ranpura" and "Rawalpindi"

THE P. and O. Company is rapidly overtaking its war losses and new launchings are frequent. The latest additions to the huge fleet are the *Ranpura* and the *Rawalpindi*.

The *Ranpura* is a large and handsomely modelled passenger and mail steamer with two funnels, built by Messrs. Hawthorn, Leslie and Company, Ltd., Hebburn-on-Tyne, and has successfully run her trials in the North Sea. A speed of $17\frac{3}{4}$ knots was attained.

A feature of the vessel is her unique style of decorations in the carrying out of which, Lady Inchcape, wife of the chairman of the P. & O. Company, and her daughter, the Hon. Elsie Mackay, have taken the keenest interest.

The vessel is the first completed of four which the company have ordered for their London and Bombay passenger and mail service. Two of the vessels are being constructed on the Clyde, and Messrs. Hawthorn, Leslie & Co., will have ready within a few months the *Ranchi*, which is a sister ship to the *Ranpura*.

The *Ranpura* has a length overall of 570-ft., extreme beam 71-ft. 3-in., depth 47-ft., and a gross tonnage of 16,585. She will carry 312 first class and 295 second-class passengers, and has been designed on the most modern lines to ensure to the highest degree possible the comfort of persons travelling in tropical climates. There are seven decks, which provide spacious accommodation, while the saloons, dining rooms, cabins, etc., are all designed to give ample space, comfort, and convenience.

Not only have Messrs. Hawthorn, Leslie and Co., constructed the hull and engines, but they have done the whole of the woodwork required, electrical wiring and fittings, etc.,

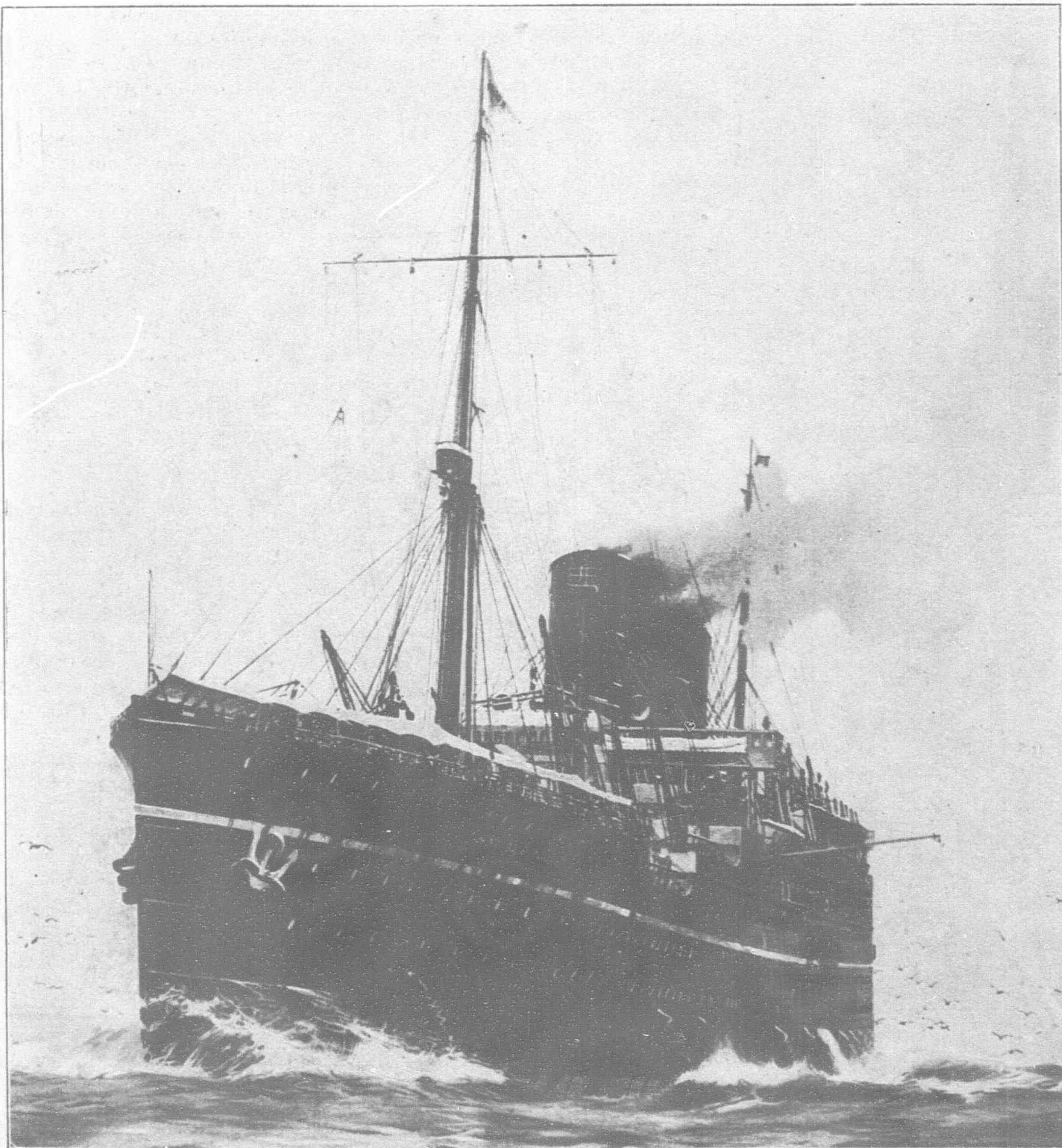
and other work which is often deputed to sub-contractors. The decorations and furnishings have been carried out to a point of highest luxury, and special systems of ventilation and heating have been provided throughout the whole vessel.

The first class saloon is decorated in a French style, and finished in grey with silver enrichments. The lounge, writing, card, and smoke rooms are designed with high ceilings, skylights and large bay windows. The lounge is decorated in Georgian style, with green and old gilt enrichments, while the writing and card rooms are finished after the style of the Adam's period. The furniture and tapestries are reproductions of the periods represented. The smoke room of early Tudor design and equipment, which is a feature of the vessel, is finished in grey coloured oak and plaster work, and it opens on to a spacious verandah.

The second saloon accommodation is designed on similar lines to the first saloon, and comprises dining saloon, lounge, and smoke rooms, cabins, etc. The main rooms are tastefully panelled and fitted with large bay windows. Other features of the vessel include

an electric passenger lift, a number of cabins de luxe, a special arrangement by which each passenger has a constant supply of fresh air under control, deck games' facilities, printer's shop, two hospitals, dispensing rooms and surgery, barber's shop, and motor life boats fitted with wireless and searchlight. The galleys, pantries, baker's and butcher's shops, etc., occupy a considerable space amid-ships, and are fitted with every appliance for the company's à la carte service. Oil fuel is used in the galleys.

There are seven large cargo holds, divided into mail rooms, bullion rooms, insulated spaces, and bulk cargo holds, and there is an efficient installation of hydraulic cranes for the rapid handling of cargo.



The P. & O. Steamer Rawalpindi

The machinery, constructed at St. Peter's Works, is of the most up-to-date type, and consists of two sets of four-cylinder quadruple expansion engines, balanced on the Yarrow-Schlick and Tweedy system, and developing about 15,000 i.h.p. Direct acting hydraulic engines and turning engines of the two-cylinder, two-crank style, are fitted to the main engines. Auxiliary machinery of the latest type is provided, and the propellers are fitted with adjustable manganese bronze blades. There are six boilers of the multi-tubular type, which burn fuel oil on the Clyde system, in conjunction with Howden's forced draught. The oil fuel burning installation is in duplicate. The refrigerating plant has been installed by Messrs. J. and E. Hall, Ltd., of Dartford.

"Rawalpindi"

The *Rawalpindi* is a magnificent twin-screw mail and passenger liner of over 16,000 gross tons, built by Messrs. Harland and Wolff, Ltd., Greenock. The new vessel, which is classed 100A1 at Lloyd's, is 570-ft. by 71-ft. by 47-ft. 6-in., and has a straight stem and cruiser stern. There are twelve watertight bulkheads, extending to the shelter deck, dividing the vessel below the main deck into seven cargo spaces, cross bunker, two boiler rooms, engine room, fore peak and after peak. The double bottom extends right fore and aft and is divided into compartments for the carriage of oil fuel, fresh water and ballast water. Water ballast can also be carried in the fore and after peaks.

The first class accommodation, which has been arranged on the promenade, bridge, shelter and upper decks, is on a luxurious scale, and provision has been made for 307 persons in this class. In the dining saloon, the walls and ceiling of which are finished in old ivory white, all the passengers can dine at the same time. The walls of the lounge are panelled and finished in ivory white, the ceiling of this apartment being finished in flat ivory white. The music and writing room is in the Adam's design, with Wedgwood treatment. The smoke room walls are panelled in cedar wood, and at the after end is situated the verandah—a very pleasant apartment. The main staircase is in oak with wrought iron balustrading, the smoke room staircase being of cedar wood. An elevator also extends from the dining room to the promenade deck.

The second class comprises accommodation for 266 persons and is also of a thoroughly up-to-date character, the provision made of the comfort of the passengers leaving nothing to be desired. In addition to the dining saloon, the accommodation in this class includes the smoke room and music room, and the design and arrangement of these apartments embody the latest ideas, while the furnishings are attractive and appropriate throughout. The state

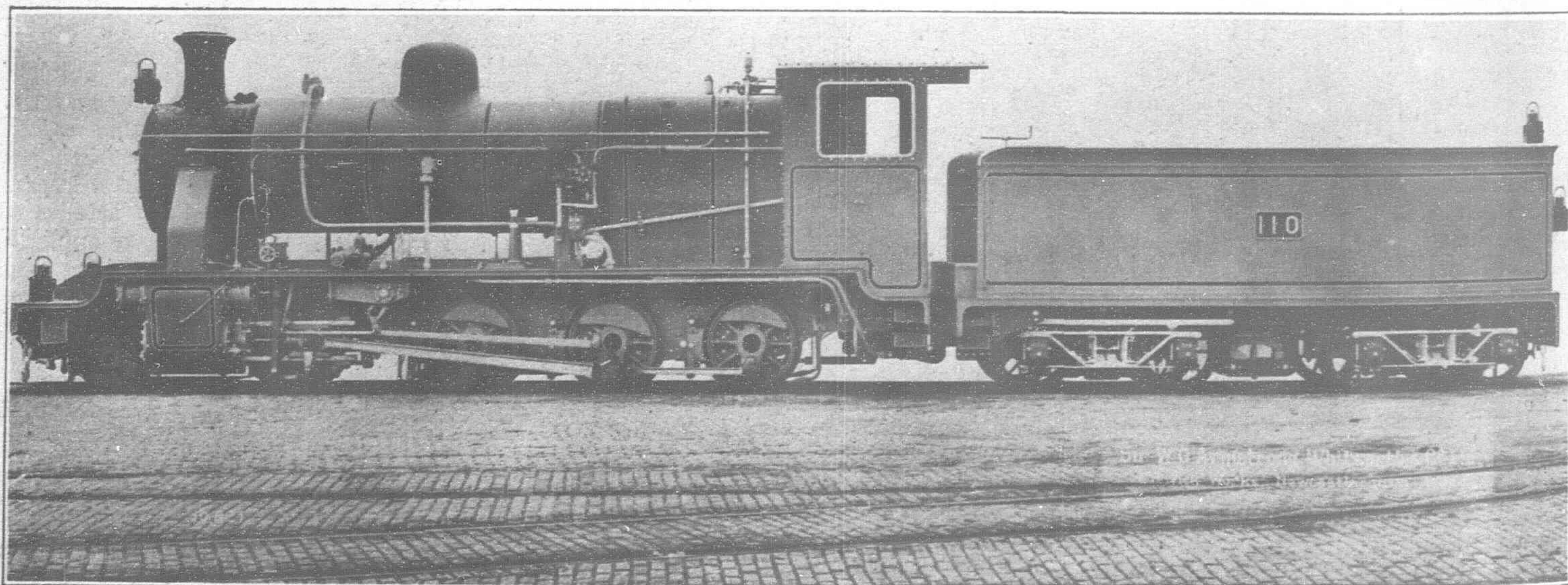
rooms, in every case, have natural light and ventilation; an ample supply of water being laid on to wash basins throughout the accommodation, while the system of mechanical ventilation ensures the comfort and well-being of the passengers in tropical climates. Single berth state rooms with cot berths have been fitted to an unusual extent, and a number of two berth state rooms is also provided.

Special detail has been given to every detail of construction and outfit affecting the safety of the ship. In addition to the watertight sub-division afforded by the twelve bulk heads already referred to, the provision of closely sub-divided oil burners along the ship's side in way of the boiler rooms, forms an additional safeguard of undoubted value. A complete installation of hydraulic cargo gear is installed to ensure expeditious and silent handling of cargo, while the electric installation is of a very complete character for illumination, heating and power purposes.

The propelling machinery of the *Rawalpindi*, which has been constructed at the firm's Belfast Works and will be fitted on board at that port, consists of two sets of quadruple-expansion engines of the balanced type of about 15,000 i.h.p. supplied with steam at 215 lbs. pressure by six double-ended cylindrical boilers fitted with forced draught and arranged for burning oil fuel. The vessel is fitted throughout with Welin quadrant davits.

Messrs. Wailes, Dove Bitumastic, Ltd., have applied their Bitumastic solution and Birumastic enamel to the tunnel well, tunnel spaces and engine-room tank, also their Bitumastic solution and Bitumastic covering to the deck in distiller room and tank top in tunnel spaces. They have applied their Bitumastic heat-proof cement to the tank top in engine room thrust recess, drain well in engine room, tank top in forward and after boiler rooms, drain well in boiler room, boiler stools and deck in refrigerating machinery space in engine-room.

The Browning Crane Company is the new name adopted by the Browning Company of Cleveland, makers of locomotive cranes and buckets. The change of name is made to secure a closer tie-up with the company's well-known specialty which it has manufactured for the past twenty-five years and which are in use in all parts of the world. The Browning plant and main offices are located at 16226 Waterloo Road, Cleveland, Ohio. Branch offices are maintained in New York City, Philadelphia, Chicago and St. Louis, with sales agents in Portland, Los Angeles, San Francisco, Montreal, Birmingham and London, England. Browning cranes are built in sizes from 10 to 40-ton capacity.



ARMSTRONG WHITWORTH LOCOMOTIVES

The illustration here shows a new 4—6—0 type Locomotive with double bogie tenders. These Locomotives have been designed and constructed by the Armstrong Whitworth Company for the Portuguese West African Government

They are of a particularly powerful character and designed for a maximum axle load of 10½ tons.

The Siamese Gunboat "Ratanakosindr"

THE Royal Siamese gunboat *Ratanakosindr* was launched late in April, with great *éclat*, from the Armstrong yard of Sir W. G. Armstrong, Whitworth & Co., Ltd., High Walker. The christening ceremony was performed by Madame Bides Bochanavisuddhi, wife of the First Secretary of the Siamese Legation in London.

The builders were represented by Sir Eustace Tennyson d'Eyncourt, K.C.B., F.R.S., etc., managing director of the Armstrong Shipyards, and various others.

The Royal Siamese Government was represented by His Excellency Phya Prabha Karavongse, the Siamese Minister in London, Eng.-Commander Luang Jamni Kolakarn, resident Inspector for the Royal Siamese Government, the First Secretary of the Siamese Legation in London, Sub-Lieutenant Datt Bunnag and Sub-Lieutenant Djamrat, while Sir Archibald Ross, K.B.E., represented the engine builders, Messrs. Hawthorn, Leslie & Co., Ltd.

Among the numerous invited guests present were representatives of the British Admiralty, Board of Trade, Lloyd's Register, British Corporation, Cunard Steamship Company, London Trinity House, etc.

In a speech after the launch Sir Eustace d'Eyncourt said:—"The vessel which has just been successfully launched is the first war vessel launched from the Armstrong Naval Yard for a foreign Power, and her construction is, in fact, the performance of a pre-war contract between the Royal Siamese Government and Armstrong, Whitworth & Co., Ltd. In 1913 we were entrusted with the construction of a river gunboat for the Royal Siamese Government, and the building of the vessel was in progress at the outbreak of war in 1914. Unfortunately, owing to restrictions imposed by the British Government, work on that contract was suspended, and eventually the material for the vessel already on the blocks and the machinery manufactured were scrapped. The contract for the vessel was subsequently cancelled, and a new contract was entered into with the Royal Siamese Government on July 30 last for the present ship.

"The interference in the construction of the first vessel and the cancellation of the original contract has not been without its compensations, so far as the Royal Siamese Navy is concerned.

The design of the *Ratanakosindr* has been gone into fully, and the experience gained during the war and the improvements resulting from that experience will be embodied in the vessel launched to-day. She is intended for service on the rivers, estuaries, and coast line of Siam, and this particular service has imposed limits on her dimensions and displacement.

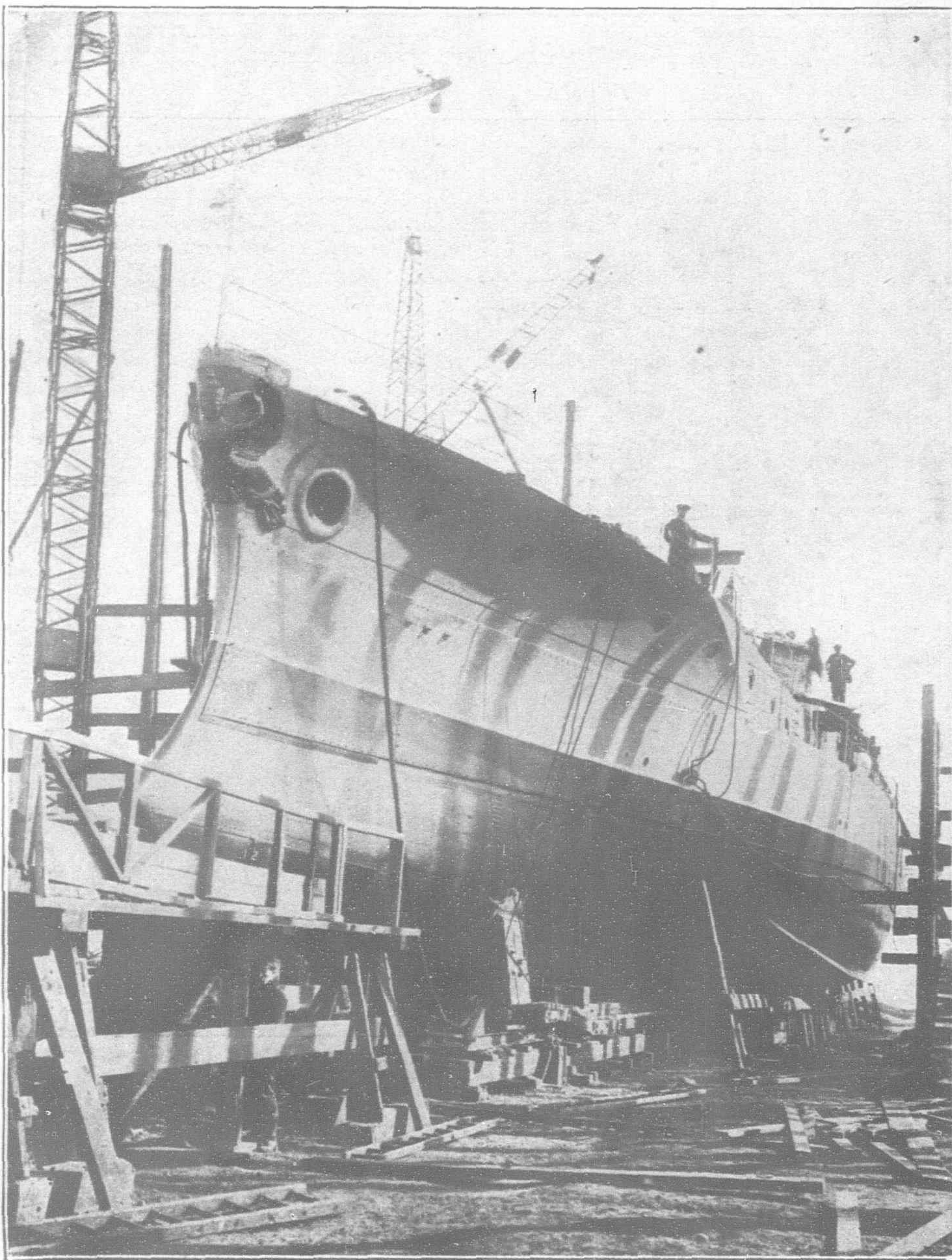
"It is a great pleasure to me, on behalf of the directors of my firm, to welcome His Excellency Phya Prabha Karavongse and his suite to our shipyard. We appreciate the visit of His Excellency very much, which I know has been made at some inconvenience to

himself in view of the matters of great importance requiring his attention in London at present, and which will necessitate his return this afternoon.

"We are glad to have associated with us in carrying out this contract Messrs. Hawthorn, Leslie & Co., who will supply the propelling machinery of the vessel under the personal direction of Sir Archibald Ross. Messrs. Hawthorn, Leslie & Co. have a world-wide reputation as manufacturers of all types of marine engines, and they have been associated with us on many previous occasions in connection with some of our most important contracts, such as H.M. battleship *Monarch*, H.M. armoured cruiser *Achilles* and the light cruisers *Birmingham* and *Dunedin*, the Chinese trading ship *Chao Ho*, the Turkish light cruiser *Abdul Hamid*, and the Turkish Royal yacht *Ertho Groal*, for which vessels they supplied the main machinery.

"We have been afforded great help and assistance in carrying out this contract by Engineer-Commander Luang Jamni Kolakarn, the resident inspector on behalf of the Royal Siamese Government, and his assistants, and I wish to take this opportunity of expressing the thanks of our officials and staff for their assistance and co-operation.

"You have all had an opportunity of walking through this very large shipyard, and in the course of that walk you have perhaps remarked upon its emptiness. The ship we have launched this afternoon is the only one in that portion of the yard except the British battleship *Nelson*, which is the last of its kind under the Washington Agreement which can be built until 1931. It is true that we have a few moderate-sized tankers and cargo ships at our mercantile yard, but the only way in which this great establishment can be kept going is by keeping the Armstrong yard full also.



The Siamese Gunboat "Ratanakosindr." recently launched from the High Walker Yard of Sir W. G. Armstrong, Whitworth & Co., Newcastle-on-Tyne

"To do this now is an extremely difficult matter, and it can only be done by our all pulling together and working as hard as possible in every way. We are up against the fiercest competition in mercantile shipbuilding that has ever been experienced in this country, and the Germans especially are trying to wrest from us the supremacy in shipbuilding which this country has hitherto held. Only to-day I see that it is reported that the German Government are giving special rates for the carriage of steel and other shipbuilding material, and in face of this competition, in which they have every help from their Government and from the local authorities, it behoves us to think how we can possibly hope to compete and retain our supremacy in this, which has, perhaps, been the most important and beneficial industry of our country."

Description of the Vessel

The particular services on the rivers, estuaries and coast line of Siam for which this vessel is intended imposes limitations upon the dimensions and displacement; but notwithstanding her small size, it is interesting to note the combination of offensive and defensive qualities that have been incorporated in the design of the vessel, without exceeding a normal displacement of 1,000 tons.

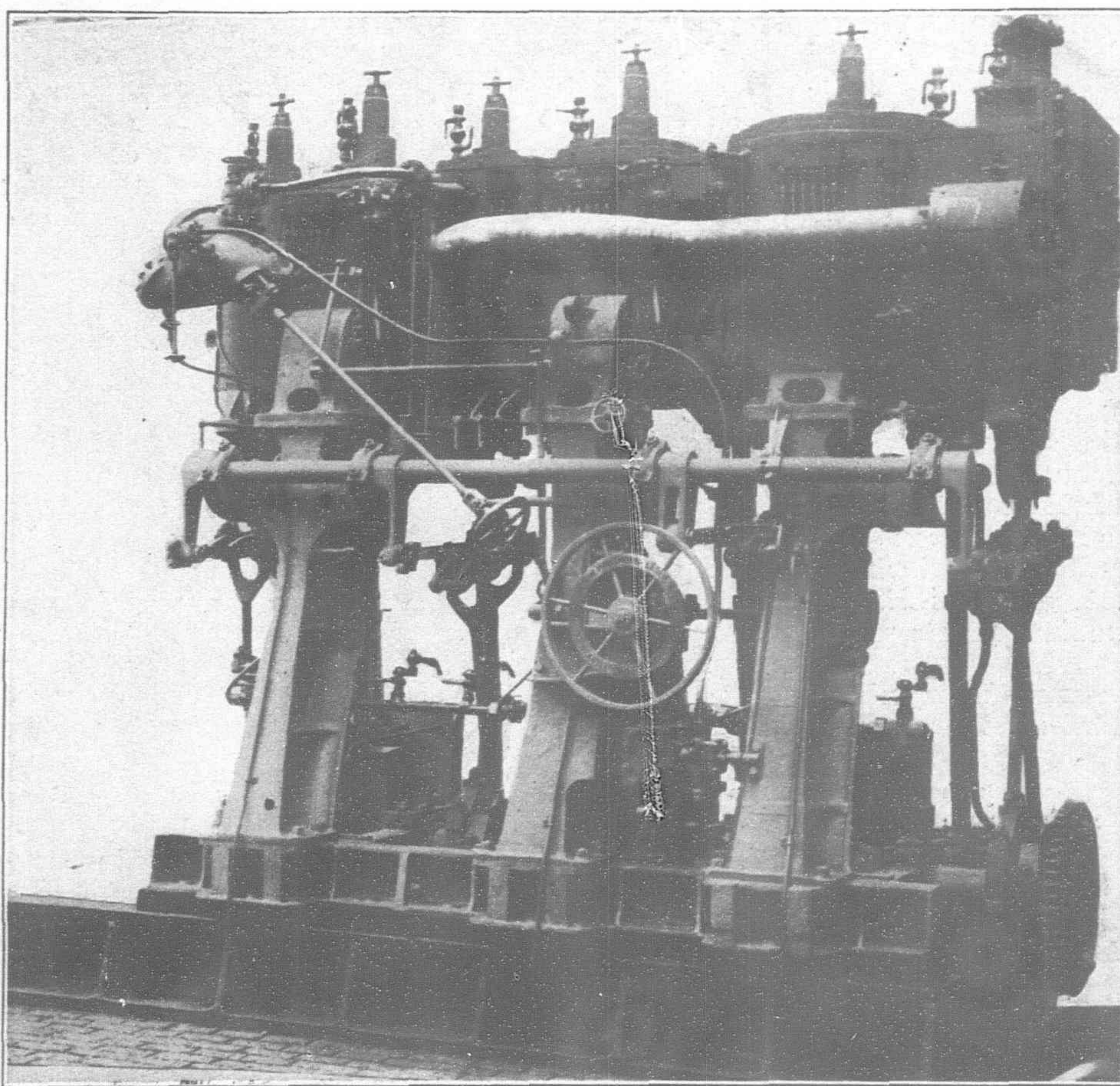
The principal dimensions of the vessel are:—

Length, overall, 175-ft.; length between perpendiculars, 160-ft.; breadth moulded, 36-ft. 6-in.; depth moulded to upper deck, 14-ft. 11½-in.; mean draught in normal condition, 10-ft. 9-in. The protection of the vessel consists of an armour belt composed of nickel steel 2½-in. thick, running for a length of about 100-ft. amidships, and covering machinery and magazine spaces, and extending from the upper deck to 2-ft. above the normal waterline. This mid-ship belt is extended to the ends of the vessel by nickel

steel belts of similar depth, having a thickness of 1½-in. At the ends of the 2½-in. belt transverse armour bulkheads are fitted, that at the former end being 2½-in. thick from the upper edge of armour belt to the sunk upper deck and 1-in. from the sunk upper deck to the bottom of the belt. At the forward end of the superstructure a nickel steel armour screen bulkhead 1½-in. extends the whole width of the superstructure. The barbette rings to the 6-in. guns are composed of nickel 2½-in. thick between the upper deck and the underside of the gunhouse.

A conning tower of cast steel armour quality with walls 4½-in. thick and a roof 1½-in. thick is fitted on the forward superstructure, and a forged steel tube 1½-in. thick affords protection to the communication leads passing from the conning tower to the interior of the vessel.

The upper deck over the machinery spaces is composed of high tensile steel 1-in. in thickness in the neighbourhood of the machinery spaces and 1½-in. thick over the magazines. The funnels above the upper deck are also protected by high tensile steel.



One of the Twin Set of Engines for the Siamese Gunboat

Armament and Fire Control

The armament will comprise:—

2 15.2 c.m. (6-in.) 50 cal. B.L. guns mounted in armoured gun-houses, one on the forecastle deck forward, capable of firing from direct ahead to 55 degrees abaft the beam on either side; and the second gun on the upper deck aft, with similar arcs of training. These guns are fitted with axial hoists, thereby enabling the ammunition to be delivered direct from the handling room to the interior of the gun-house.

Four 76 m.m. (3-in.) 50 cal. H.A.Q.F. guns are installed, two on the forward superstructure and two on the upper deck amidships, one on each broadside. These guns are to have large zones of fire, and are adapted to be used against either naval or aircraft. A rapid supply of ammunition to these guns is ensured by the fitting of two special 3-in. dredger hoists.

The main mast carries a control top, in which is installed a 9-ft. range-finder and other fire control instruments, while a special range-finder for use against aircraft is fitted on the special platform just abaft the funnel.

Two 24-in. searchlights are carried, one above the chart room forward, and a second on a special platform upon the mizzenmast. A 6-in. director sight is fitted on the roof of the chart and wheel-house. The normal ammunition supplied to the vessel consists of 100 rounds for each 15.2 c.m. gun, and 300 rounds for each 76 m.m. gun.

Propelling Machinery

The machinery which is being manufactured at Messrs. Hawthorn, Leslie's St. Peter's Works, consists of an installation of twin screw vertical type expansion engines, each having cylinders 10½-in. 18-in., and 30-in., with a stroke of 22-in. capable of developing, collective power of 850 i.h.p. when running at 150 revolutions per

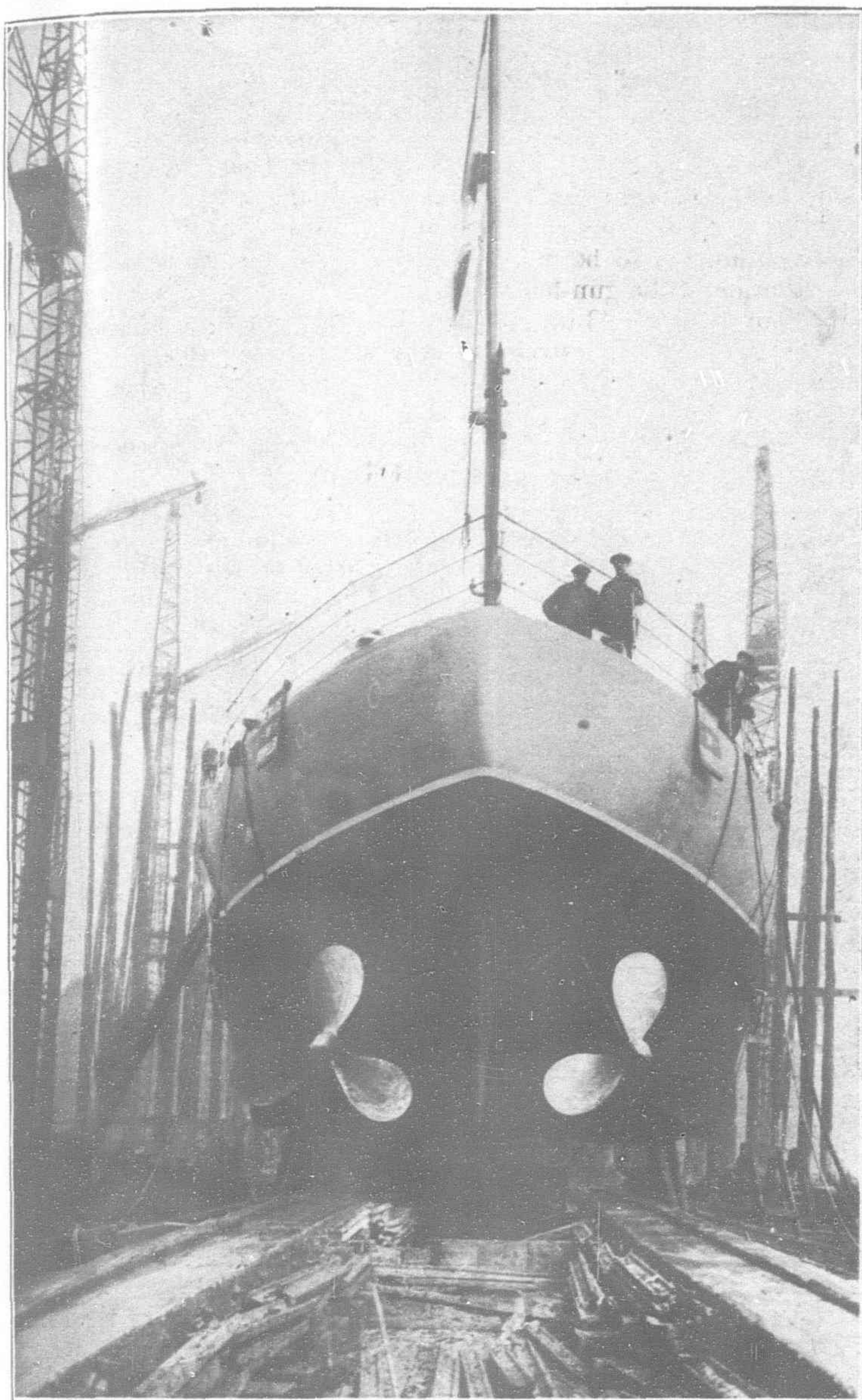
minute. It is estimated that when developing this power the vessel in a normal condition will attain a speed of slightly in excess of twelve knots.

The boiler installation consists of two water-tube boilers of the three-drum type, having a working pressure of 225-lbs. per square inch, and fitted for burning oil.

The auxiliary machinery of the vessel includes one 50-k.w. dynamo, one 26-k.w. dynamo, one petrol paraffin dynamo. An electric capstan is fitted aft, capable of working ¾-in. chain cable and 2¼-in. steel wire hawser. On the forecastle is fitted a steam capstan capable of working 1½-in. cable and 3½-in. steel wire. A wireless installation by the Marconi Company, and having a minimum range of 500 miles, is installed.

The boats carried consist of 24-ft. motor-boat of 8 knot speed, 24-ft. cutter, 18-ft. lifeboat, 18-ft. gig. These boats will be lifted overboard by a special derrick fitted on the mizzen mast.

The captain's quarters are situated at the aft end of the vessel, and consist of a saloon, separate sleeping cabin, and lavatory. Adjacent to the captain's quarters is the wardroom, wardroom pantry,



Stern View of the Gunboat just before launching

chief officer's cabin, chief engineer's cabin, and two further cabins for officers, having two berths in each.

In the superstructure amidships on the upper deck is housed the sick bay, officers' lavatories, officers' messes and pantry, ship's office, officers' bathrooms, warrant officers' bathroom, officers' galley, and crew's galley. Under the forecastle forward is provided the crew's accommodation.

Contracts for Lifeboat Wireless Sets

Recently the Marconi International Marine Communication Company has received orders from Messrs. John I. Thornycroft and Co., Ltd., for seventeen lifeboat wireless sets for lifeboats of the Peninsular and Oriental Steam Navigation Company. The same company has also placed an order with Thornycroft's for two complete sets with searchlights which are to be installed on the *Naldera* and *Narkunda*, on the return of these vessels to London. In addition the same firm are supplying ten more sets to Messrs. William Hill Limited, of Tyne Dock, for the P. & O. Company. Messrs. Harland & Wolff Ltd., have also placed a further order for twenty-two installations, which will be fitted in various life boats at Belfast, Liverpool and Southampton, during the next few weeks. In addition to these orders placed in England for vessels trading with the Far East, The Canadian Pacific Steamships, Limited, have ordered twenty-seven sets, the Atlantic Transport Company two sets, the Anchor-Donaldson Line Ltd., four sets, and Messrs. Hamblin & Company of Blackwall, four sets.

New Indian Cable Steamer

The *Patrick Stewart*, a new cable steamer, constructed by Messrs. William Simons & Co., Ltd., of Renfrew, for the Indian Government Telegraphic Service, has lately been successfully launched.

The vessel has been built under the direction of the naval architects, Messrs. Sir J. H. Biles & Company of London and Glasgow. She is fitted with two sets of triple expansion surface condensing engines, and steam is supplied by two cylindrical multitubular boilers, fitted with forced draught and oil-burning installation, and is specially fitted up for work in a hot climate with regard to ventilation, refrigerating plant, etc. The cable machinery is of the latest and most approved type.

The christening ceremony was performed by Mrs. Simpson, wife of Mr. M. G. Simpson, director of the Indo-European Telegraph Department.

New Mail Steamer for D.E.I. Service

There has recently been launched from the yards of the De Schelde Royal Shipbuilding Company of Flushing, the twin-screw motorship *Indrapoera*, for the Rotterdam Lloyd Mail for passenger and cargo service between Rotterdam and Batavia.

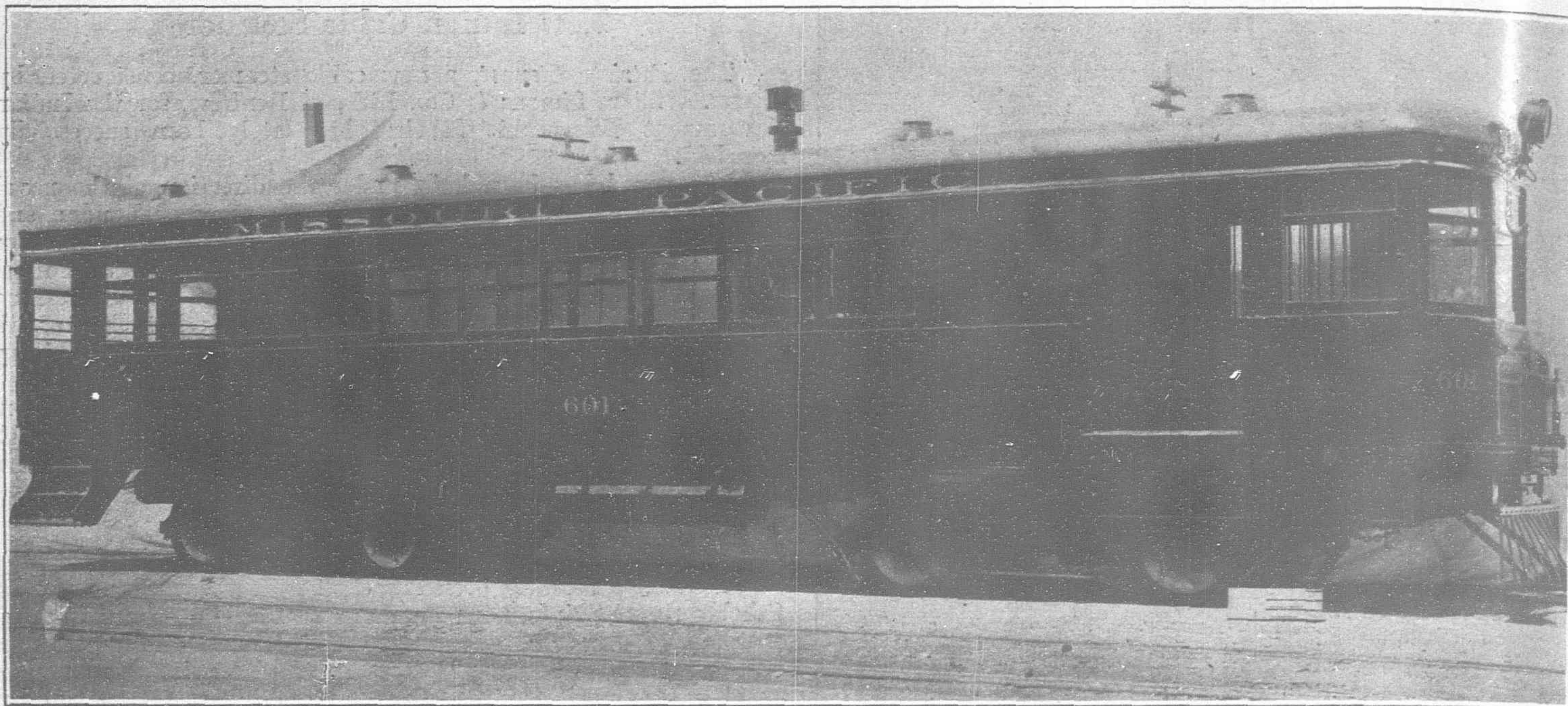
The gross register tonnage of the vessel is about 10,500 and her principal dimensions are: length on load water line, 500 feet, extreme breadth 60 feet, and depth to upper deck 38 feet. The ship will be propelled by two Schelde-Sulzer marine Diesel engines each developing 3,500 shaft h.p. at 85 revolutions per minute, which will give the ship a mean speed of 15 knots at sea fully loaded. The engines are of the two-cycle single-acting type, with cylinders 760 mm. diameter by 1,340 mm. stroke, and each engine drives two air compressors from separate cranks at the forward end; scavenging air is supplied by two electric ventilators. All auxiliaries not driven by the main engines are electric, current being supplied by 4 dynamos, each coupled to a four-cylinder Schelde-Sulzer two-cycle Diesel engine of 400 effective h.p. The machinery is placed in two watertight compartments, the after compartment containing the main auxiliaries oil engines and electric dynamos, the forward compartment electric transformers, auxiliary air compressors, refrigerating machinery and other auxiliaries, including a dynamo driven by a 100 h.p. Kromhout oil engine to supply current to the deck machinery in port. The main and auxiliary Diesel engines are being built and installed by De Schelde Company.

A Handbook on Superheated Steam

SUPERHEAT ENGINEERING DATA—A Handbook on the Generation and Use of Superheated Steam. Sixth Edition Revised. (Superceding Data Book for Engineers.) The Superheater Company, New York and Chicago, 1925. Bound in Keratol, 4½ by 7-in., 208 pages, 85 illustrations and diagrams, 69 tables. Price \$1.00.

This handbook contains condensed data for steam power plant engineers and operators. A feature of the book is the index consisting of 16 pages, assuring ready reference. Superheated steam, its advantages over saturated steam, and the proper design and performance of superheaters, are briefly discussed. It illustrates superheater arrangements in practically all stationary, marine and locomotive type boilers commonly made in America. Waste heat, portable and separately fired superheaters are also shown. Brief comparative data is given as to sizes, tube sizes, arrangement of tubes, etc., for the stationary water tube boilers illustrated. The steam tables cover pressures from below atmospheric to 600 lbs., absolute, and include properties of superheated steam from 50 to 300 deg. F. superheat.

The section on piping includes information for figuring piping for handling water, saturated and superheated steam, and velocity and pressure drop of water and steam flowing through piping. In this section is included also the proposed American standards for high pressures. Superheat Engineering Data also contains engineering data on coal and oil fired boilers, which include tables of heat values for gaseous, liquid and solid fuels. Other miscellaneous data include complete conversion tables and data on bolts and screw threads, with the recent work of the American Engineering Standards Committee, and the National Screw Thread Commission. There are also many miscellaneous tables frequently used by steam engineers.



Brill Model 55 Gasoline Car

J. G. Brill Company's Gasoline Cars

OPERATING costs in excess of existing revenue on short line railroads and branch lines of trunk systems have been confronting the railroads for many years. Various experiments have been made to reduce expenses and to stimulate business with more or less success but never with complete satisfaction. Within recent years through the expansion of the automotive industry gasoline-propelled vehicles have been developed for this service. Their outstanding features, of course, have been the comparatively low cost of equipment, the low cost of operation in replacing the usual locomotive and coach, and the possibilities opened up by these economies for increasing the service, thereby stimulating business and increased revenue. In this publication some operating results are given which give a general idea of what these gasoline cars accomplish, as well as a comprehensive idea of design and construction of modern types of equipment.

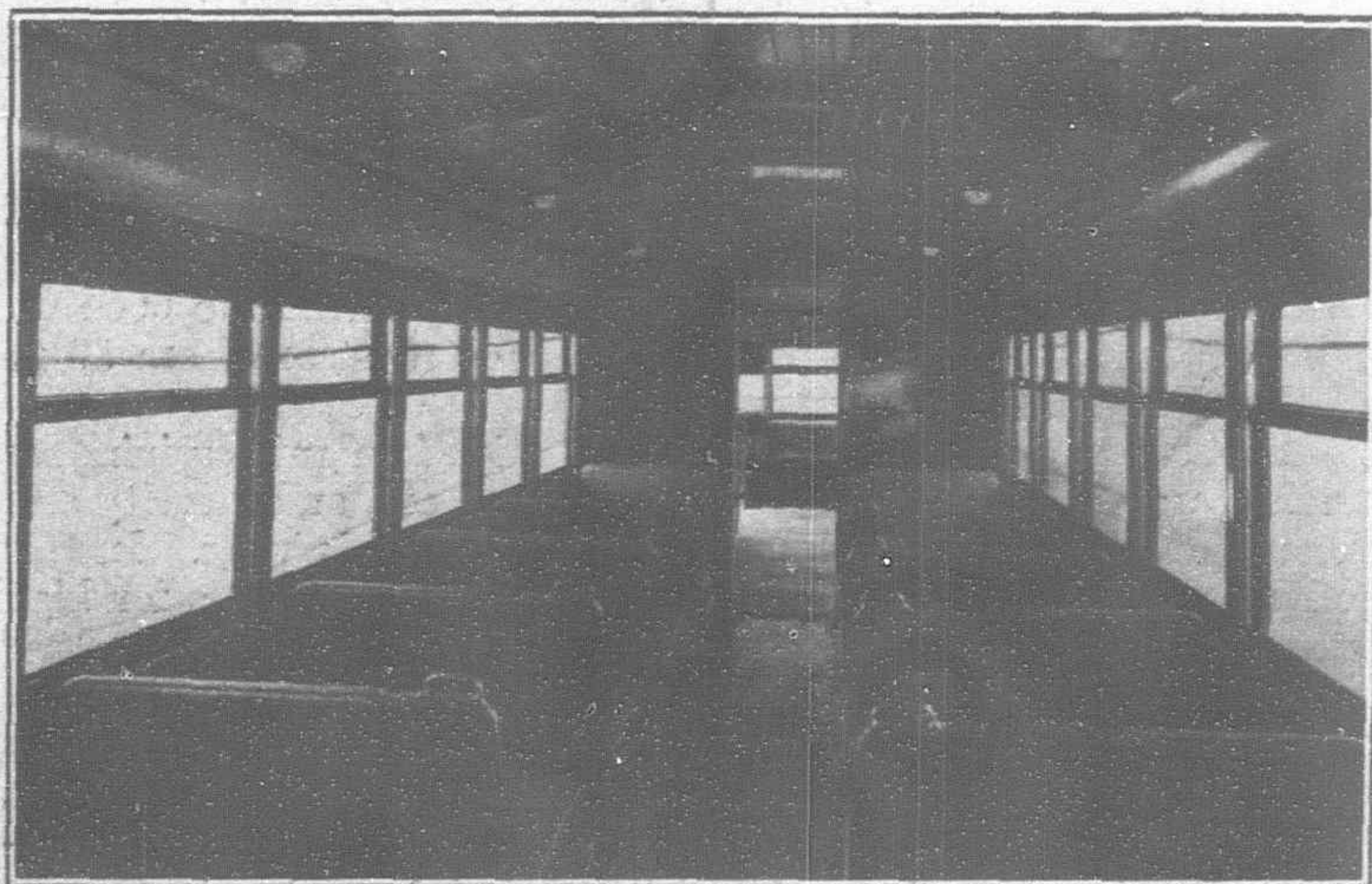
The introduction of Model 55 type marked an advance in the development of gasoline equipment on steam railroads, which stimulated interest and, consequently, resulted in a more general use of gasoline-propelled rail vehicles.

Prior to the development of the Model 55 Gasoline Car, the tendency was toward the use of smaller and lighter traffic lines, and

which were designed more along the lines of a motorbus on rails with flanged wheels at rear and small four-wheel pony truck at front. This type is represented by our Models 30 and 43 illustrated on pages 9 and 10. The necessity for equipment capable of meeting the requirements of the heavier traffic on many short and branch lines was soon recognized and the Model 55, more in keeping in appearance and riding stability with modern railroad equipment, was designed.

An outstanding feature of the many installations of the Model 55 Gasoline Car is the successful manner in which it has supplanted the steam locomotive and single coach, generally employed in short and branch line service, and its comparatively low cost of operation. Of course, the different conditions encountered on various lines will naturally result in a wide range of operating costs, but regardless of this fact the comparison with the cost of the replaced equipment is so favorable to the gasoline car that service is possible at a profit on lines which had been previously operated at a loss. In most cases the operating cost per mile of the Model 55 Gasoline Car is about one-fourth that of the steam locomotive and coach.

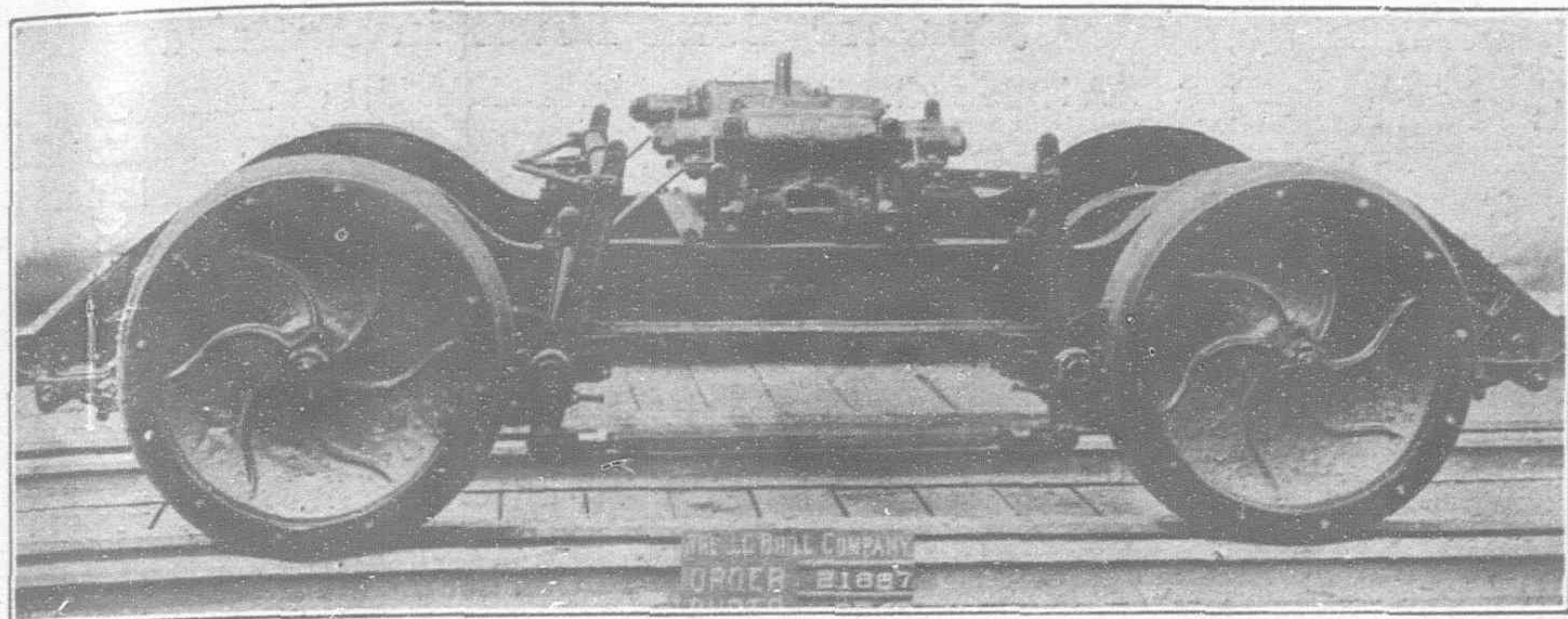
The Gulf, Texas & Western Railroad, which had discontinued its passenger service over a period of two years, placed in service a Model 55 Gasoline Car, of the combination passenger and baggage



Passenger Section of a Brill Gasoline Car



Freight Section of the Same Car



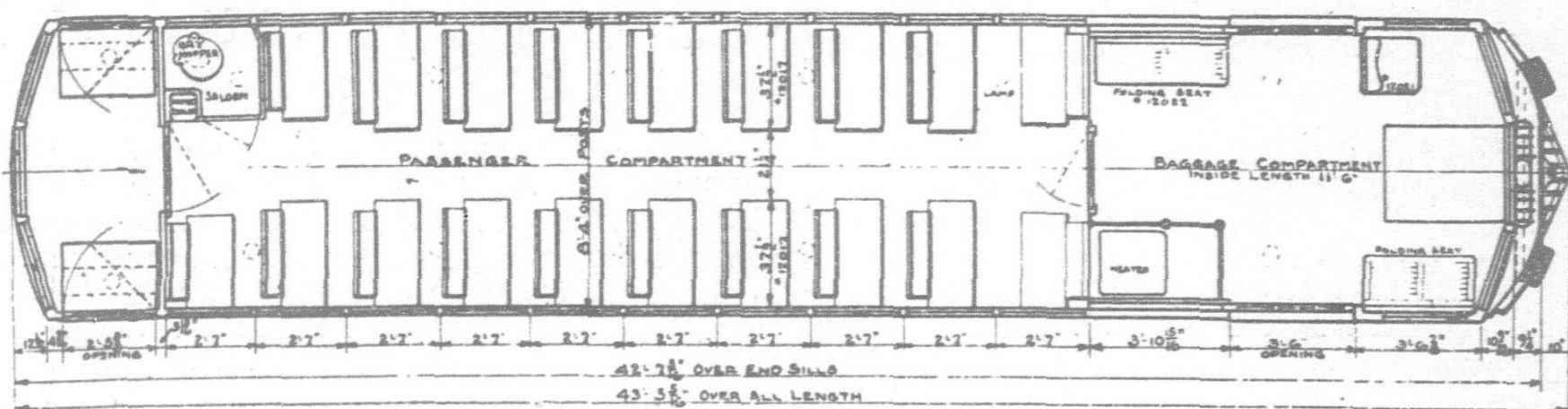
Truck Under Model 55

type, between Mineral Wells and Seymour, making one trip daily or a distance of 216 miles. Reports of its operation show a most consistent performance. During the first seven months in service, it never missed a daily trip, something which could not be said for its predecessor and its record of being on time 97 per cent. of the time is also noteworthy.

Prior to the inauguration of gasoline car service the company had been standing continually a loss of from \$3,000 to \$5,000 a month, which was not only eliminated but a profit of from \$2,000 to \$3,000 was soon being made. An analysis of a report of this car for a period over three months shows that in operating 19,872 miles the cost per train mile was but 15.3 cents and that gasoline or fuel consumption averaged 7.19 miles per gallon.

Among some other operating reports submitted are the following, which are representative of the results generally obtained with Model 55 cars. In every case reported thus far, even in the highest, the comparison

with the cost of steam train operation is so favorable to the gasoline car that all the railroads having placed this of type car in service have shown worthwhile economies.



Cross Section of Car

RAILROAD	Days Operated	Total Miles Run	Average Operating Miles per Gallon	Cost Per Mile
St. Louis, San Francisco Railway	177	35,000	6.05	.259
Cleveland, Cincinnati, Chicago and St. Louis	306	48,650	5.8	.291
Philadelphia and Reading	31	2,877	6.27	.26
Chicago Great Western	285	45,894	5.63	.2446
Tennessee, Alabama and Georgia	27	5,041	6.57	.1996

The attitude of the travelling public toward the Model 55 Gasoline Car has been very favorable. In such cases where it is possible to provide two trips daily service in place of one daily trip of the steam train, the operating companies have received much commendation. It is invariably found that with the installation of these cars, the public is much pleased with the service and would be loath to return to the old conditions.

In view of the necessity for furnishing a combined passenger and baggage service on most short and branch line railroads, the most popular type of Model 55 Gasoline Car has been that having accommodations for both.

This car measures 43-ft. 5 ⁵/₁₆-in. over pilot and has a total seating capacity of 43, five of which are on folding slat seats in the baggage compartment. This latter compartment measures 11 ft. 6-in. long inside and, in addition to 70 square feet of baggage storage space, there is also available room for the operator and the engine equipment.

The carbody is constructed of steel. All lower sash, with the exception of that to the operator's left, raise; and each side of the rear platform is enclosed with a single swing type door, glazed in the upper portion, which folds against the rear body bulk-head, a standard steel trap door covering the step opening when this door is closed. A single sliding door of ash, 3-ft. 6-in. wide, glazed in the upper portion, is provided on each side of baggage compartment.

In the passenger compartment there are 19 non-reversible transverse seats, with spring edge cushions, upholstered in brown imitation leather. Interior of the passenger compartment is finished in cherry stained mahogany with carline celinings and agasote lining below the window rail.

Renitent Posts

An outstanding feature of all Brill Model 55 Gasoline Cars is their construction with Brill Renitent spring brass post casings. This feature, while adding very little to the car weight, makes possible a sash fit which is both air, dust and water tight. With this construction the stiles of the lower side window sash, which raise, are fitted with brass channels which slide in grooves of the spring brass post casings.

The Power Plant

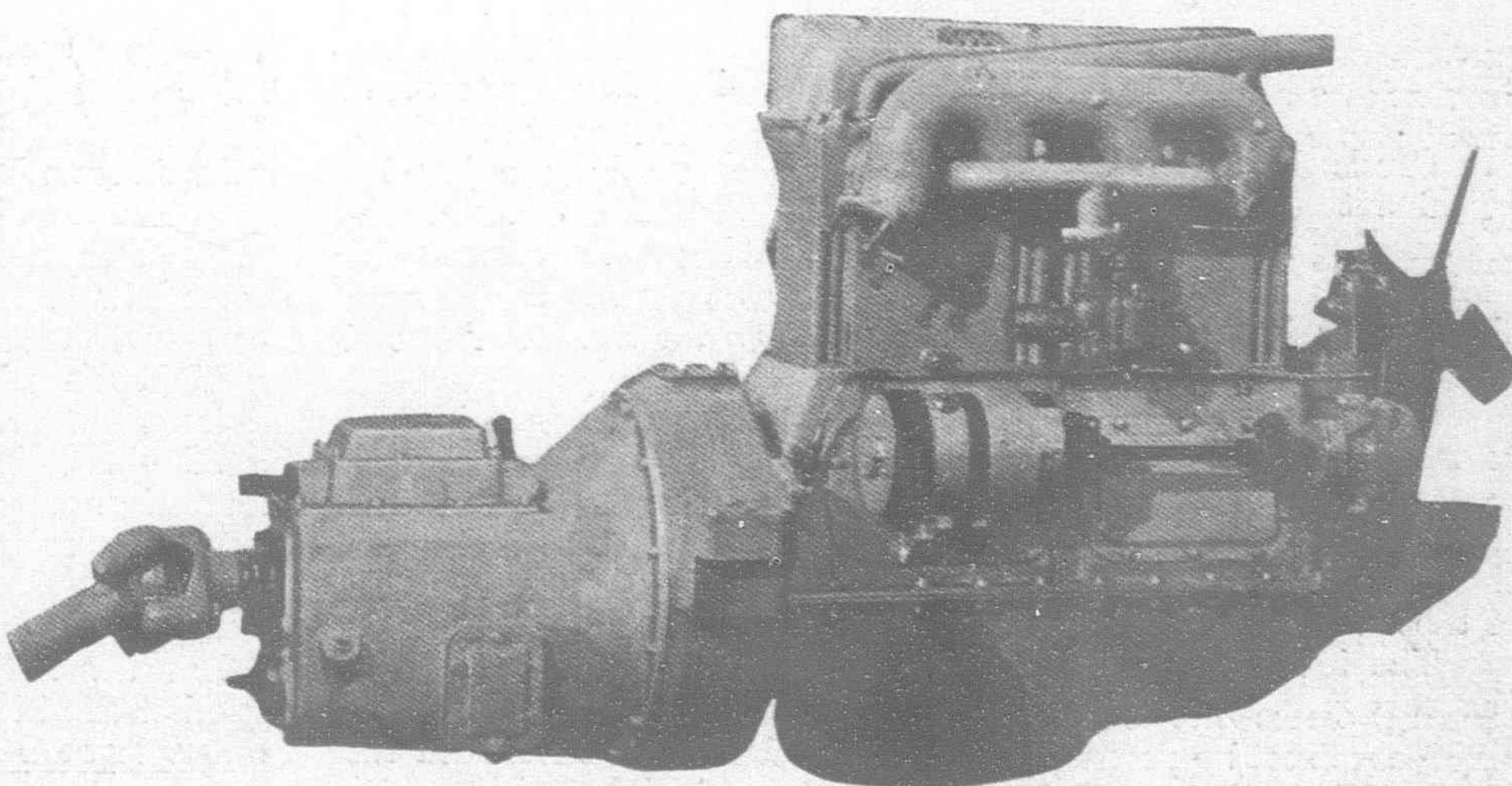
The engine equipment of Brill Model 55 Gasoline Cars is the most powerful heavy duty type available, developing as high as

68 h.p. at 1,500 r.p.m., which propels the car at a normal speed of 38 miles per hour. This engine drives the car through a multiple disc clutch and 3-speed heavy duty transmission to an auxiliary transmission housed in

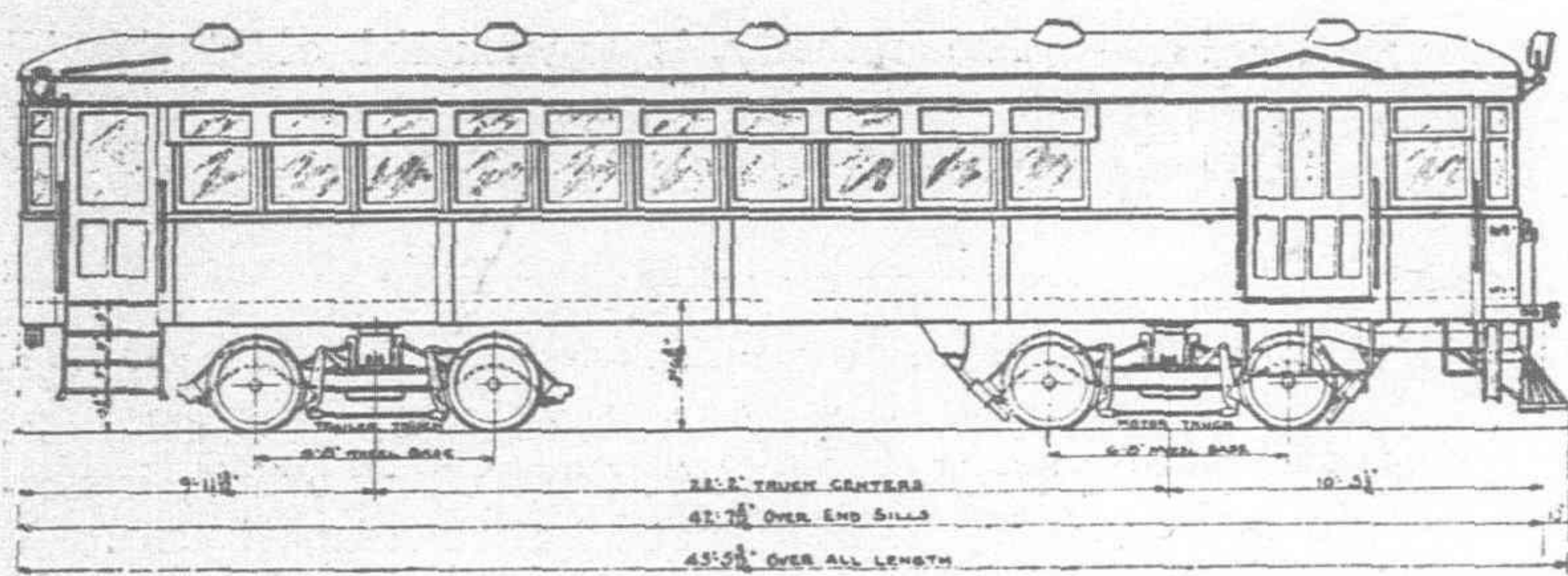
the cast steel bolster of the forward or motor truck. There is provided a total of six speeds forward and three reverse. This engine is located under the hood at the forward end of baggage compartment and is removable as a unit.

The Trucks

The Brill 81-Motor and 81-Trailer Trucks illustrated on page eight are standard for Model 55 cars. Simplicity predominates the design of both trucks and, while the forward truck is equipped with the auxiliary transmission, in many instances like parts, such as



Four-cylinder four-cycle valve-in-head heavy duty type engine representing the power equipment used in Brill Model 55 Gasoline Cars



Length of baggage compartment, 11-ft. 3-in.; total seating capacity, 43; weight, 29,000-lb.

tires, wheels, wheel bearings, axles, truck frames, brake shoes and brake linkage, etc., are interchangeable between both motor and trailer trucks. Wheels, 30-in. in diameter, are of the patented cushion type, with rolled steel removable tires and cast steel centers. Trucks have 22-ft. 2-in. truck centers and are capable of operation on roads having a minimum curve radius of 70 ft.

In addition to semi-automatic air-brake equipment the brake linkage is connected to emergency brake staffs operating with Brill Vertical Handle Brakes, one each of which is located against both front and rear body vestibules.

Trailers

In some instances we have been called upon to furnish either passenger or baggage trailers. These are mounted on No. 81-T trucks and have been developed according to the requirements of the contemplated service. The passenger cars, like the one illustrated above, conforms in general details of construction to the passenger compartment of the combination passenger and baggage cars, measuring 34-ft. 2-in. over platform and accommodating 36 additional passengers. This unit weighs 23,380 pounds complete on the rails.

Brill Gasoline Car Trucks

The three types of Brill Gasoline Car Trucks illustrated were designed to provide a particular type of truck equal to the service requirements of each type gasoline car. They were developed after a most careful study of the requirements of gasoline car service and with the experience of Brill engineers gained in long identification with the field of electric traction cars and trucks.

Ingersoll-Rand's New Arrangements

A CONNECTION of much significance to the engineering world has lately been arranged between Carels Brothers of Ghent, Belgium, and the Ingersoll-Rand Company of New York City, by which the Belgian concern will have the right to manufacture the well-known Ingersoll-Rand solid-injection type of oil engine.

Carels Brothers—organized in 1875—have long enjoyed a prominent place in the industrial life of Belgium, a country of outstanding importance among the engineering and manufacturing nations of the world. To-day, after successive periods of expansion, Carels Brothers are officially known as the Société d'Electricité et de Mécanique.

Carels Brothers were among the first of the European licensees to work under the Diesel patents; and Carels-Diesel engines have won wide recognition in many fields of service because of their excellence. Even so, Carels Brothers have sought to strengthen their enviable position in this department of engineering by means of the working rights obtained from the Ingersoll-Rand Company.

The interesting feature of this arrangement is that Europe has now gone to America for the latest and the highest developments in heavy-oil engines. Thus American skill turns the tide of technical obligation by giving the fruits of its labor to Europe—the land in which the heavy-oil engine originated.

Japanese Bond Issues in America

An issue of G. \$20,000,000 bonds of the Tokyo Electric Corporation was sold to the Guaranty Company of New York. Public offering of the issue is expected within a short time. The issue is part of an extensive program of public utility expansion in Japan, in which American capital has been active. An issue of \$13,500,000 bonds of Daido, another large Japanese electric company, was floated in July by Dillon, Read & Co., and a few months ago the Guaranty Company floated a G. \$15,000,000 issue for the Toho Electric Power Corporation of Tokyo.

The super-power idea is being introduced in Japan on a broad scale, and large revenues already are in evidence. The forthcoming issue is understood to bear 6 per cent. interest and to carry a three-year maturity.

Ujigawa Floats Domestic Loan

The Ujigawa Hydro-Electric Power Company, at an extraordinary shareholders' meeting held at the Oye Building, Osaka City, on August 5, decided to float a domestic loan of Y.8,000,000. The conditions on which debentures will be issued follow:

Total face value: Y.8,000,000.

Denominations: Four: Y.100, Y.500, Y.1,000, and Y.5,000.

Interest: 7 per cent. per annum.

Redemption: By September 10, 1930, but unredeemable for the first two years.

Selling price: At par.

The Nomura Bank will take over the debentures, but the Sumitomo Bank may handle some. The Ujigawa Hydro-Electric Power Company raised foreign loans some time ago to the amount of Gold \$14,000,000. The amount was exchanged for Y.29,000,000 with a view to redeeming a Y.35,000,000 domestic loan, floated previously, but there remained a deficit of Y.6,000,000; hence the recent decision to issue new debentures, amounting to Y.8,000,000. The remainder—Y.2,000,000—will be used for promoting new business. The 7 per cent. interest on the debentures has attracted attention in financial circles, because the rate is a new record in the Japanese bond market.

Refrigerating Plant in a Butcher's Establishment

Futterer's, a well-known butcher's establishment and restaurant in Shanghai, has had a refrigerating plant installed for cooling the cold storage rooms and a special service counter fitted with cooling coils. This butcher's establishment is one of the largest and best-equipped in China and has an excellent reputation. There is a restaurant on the first floor which is frequented by foreign residents. The refrigerating plant consists of a vertical Sulzer ammonia compressor rated at 29,000 b.t.h.u. per hour. The Sulzer plate condenser generally used in connection with such a plant was not fitted, as the only water available for cooling purposes is warm and muddy. A double-pipe condenser has therefore been installed, the water pipes of which can easily be cleaned.



Butcher's Establishment and Restaurant, Shanghai equipped with Sulzer Refrigerating Plant

A New Armstrong Whitworth Pneumatic Grinder

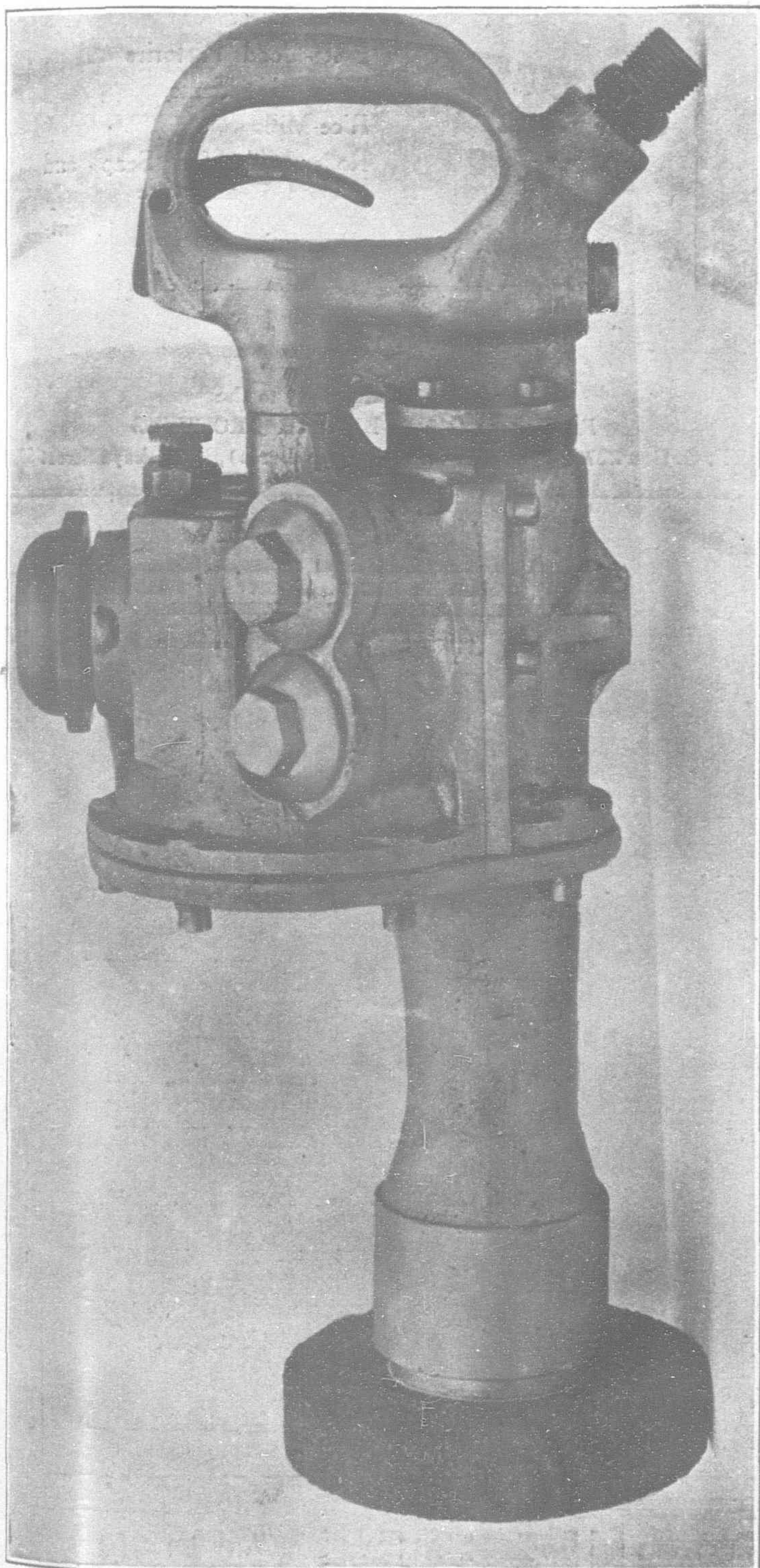
A NEW model of the A. W. Pneumatic Tools is illustrated here. This is a handy grinder for General Work.

The special feature of this tool is its lightness combined with high efficiency.

Being made largely of a special aluminium alloy it weights only 14-lbs. as compared to some 37-lbs. for other types of the same size.

The spade handle and method of feed control adopted in this model make it exceptionally easy to handle and operate. The specification of this new machine is as follows.

Weight	Length Overall	Size of Emery Wheel	Approx Speed. at 95-lbs. per sq. in.
14-lbs.	18½-in.	5-in. by 1-in.	3,300



A New Armstrong Whitworth Pneumatic Grinder

British Competitors' Position in Eastern Railway Contracts

OUR LONDON CORRESPONDENT.

ATTENTION is being directed in England to some recent cases of the purchase of Far Eastern railway stores in Germany, but inquiry shows that they represent only a small percentage of the total orders placed. Although faced by formidable competition, in which Continental firms secure benefit from depreciated exchanges, Britain continues to secure the bulk of the contracts for India. She does so while the High Commissioner for India in London carries out strictly the orders of the Government of India to buy in the cheapest market, subject to quality, delivery, and other necessary conditions.

In a recent case 34 oil tank wagons were ordered from a German firm at the price of £9,774, while the lowest British tender was £11,540. There was a still lower German tender of £9,092, which was passed over because sufficiently early delivery was not guaranteed. Two other recent German successes have been contracts for 161 meter-gauge wagons, and for 100 oil tank wagons. Against these must be placed contracts secured by British makers for no fewer than 1,688 wagons. The position is similar in respect of locomotives, the bulk of the trade in which continues to be secured by British workshops, though on occasion the High Commissioner has no alternative but to place the orders abroad. For example, seven locomotives are at present being made in Germany at a price 31 per cent. below the cheapest British tender.

The problem for British manufacturers is how to retain their big lead—which has never been below 87 per cent. of the total supply from outside India—in supplying stores to the Government railways. In the fifteen months ended on March 26 the High Commissioner for India placed £923,000 worth of contracts with British firms out of a total of £1,249,000. The corresponding figures for the Indian railway companies working railways belonging to Government were £5,430,000 with British firms out of a total purchase value of £6,362,000.

While the British manufacturer is handicapped in competing for all Far Eastern contracts by the depreciated exchanges of Continental European countries, he has some factors in his favor. For example, many Continental firms have to cover a long distance before reaching the port of shipment, and the sailings therefrom may be relatively infrequent. Again, the additional costs of inspection to insure the quality of isolated orders in other countries may more than offset a small upward difference in the price quoted by British firms.

The essential conditions of British success in a market where no favor is shown on sentimental grounds are that costs of production should be kept down and that the high standards of quality and reliability in respect of delivery should be maintained. In the case of a railway locomotive, for instance, speedy delivery allows railway revenue to be earned quickly, and this is a consideration of importance where the one criterion is that of the interests of the Oriental taxpayer. Apparently no advantage whatever is to be gained by attempting to exercise political pressure. As far as India is concerned, she stands on the same footing in this matter as the self-governing British Dominions.

Two New Motorships for Holt Line

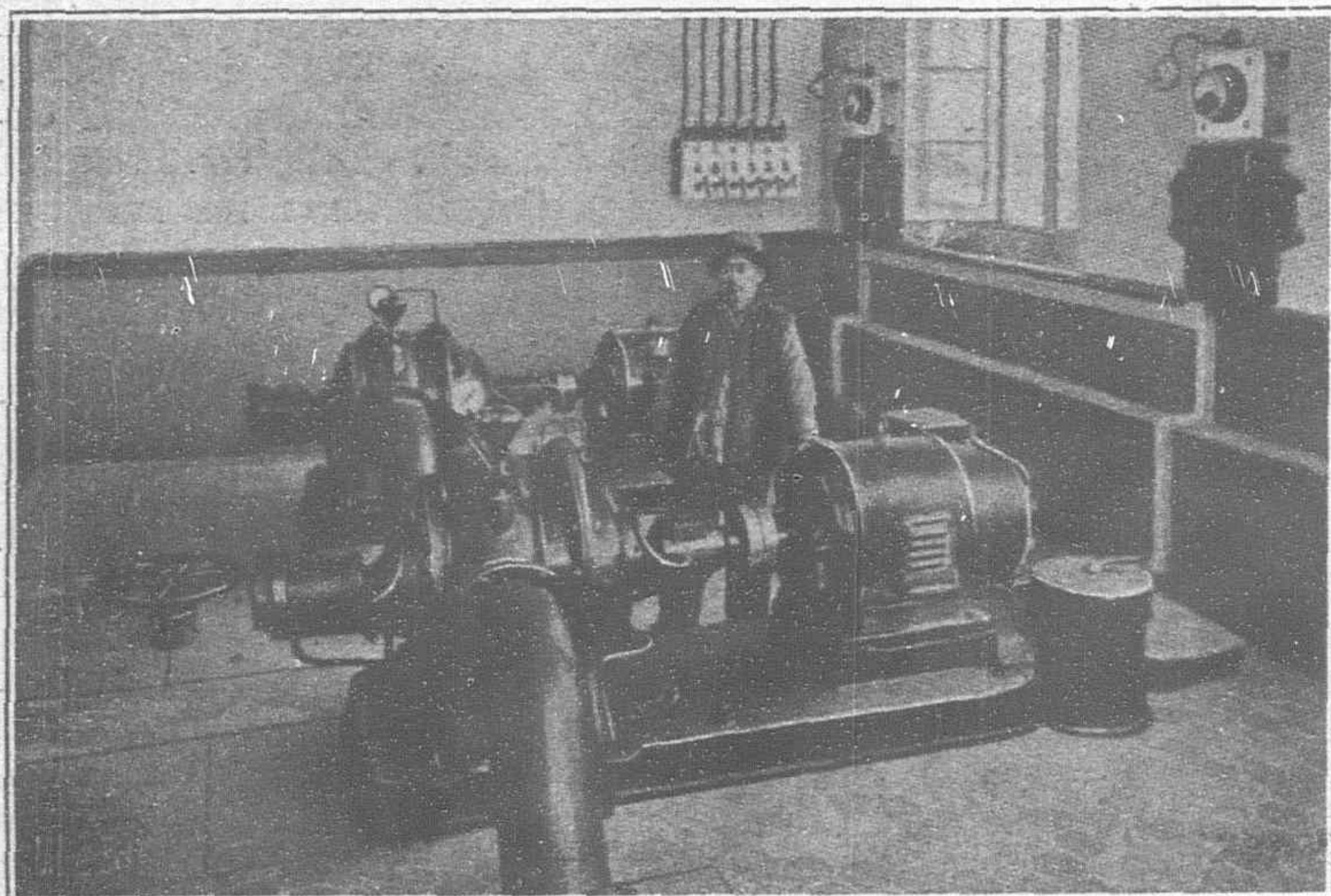
Messrs. Alfred Holt & Company, of Liverpool, have just placed a contract with Messrs. Workman, Clark & Co., Ltd., of Belfast, for the construction of two large motorships for the Eastern trade. The machinery will consist of engines of the Burmeister and Wain type.

The two new vessels will be between 450 and 500-ft. long, with a gross tonnage of about 8,000 tons and a deadweight of about 10,000 tons.

It is interesting to note that the Holt Line has been associated with Belfast for many years. Apart from the small motorship *Marudu*, which was built last year for the Straits Steamship Company of Singapore, a subsidiary concern, the last vessel for the Holt Line launched in Belfast was the *Dardanus* on April 18, 1923, and on that occasion Mr. William Boyd, managing director of Messrs. Workman, Clark & Co., stated that it was the fiftieth ship they had launched for the company.

The Tientsin Native City Waterworks Company

THE Tientsin Native City Waterworks Company has installed two Sulzer high-lift centrifugal pumps delivering the filtered water taken from three clean-water reservoirs at the waterworks into two water towers. Each of these two pumps is calculated for an output of 1,000 gals. per min., and a head of 165-ft. Each, at a



Tientsin Native City Waterworks—Sulzer Centrifugal Pumps, each delivering 1,000 gals. per min against a head of 165-ft.

speed of 1,450 r.p.m., absorbs $71\frac{1}{2}$ h.p. The waterworks are established outside the town and up river, taking their water from the Yu-Ho and the Hsi-Ho, and supplying it to the Chinese city (about 816,000 inhabitants), as well as to the French, Russian, Italian, Japanese and the former Austrian concessions. The whole plant is capable of supplying about $4\frac{1}{2}$ million gallons of filtered water per day.

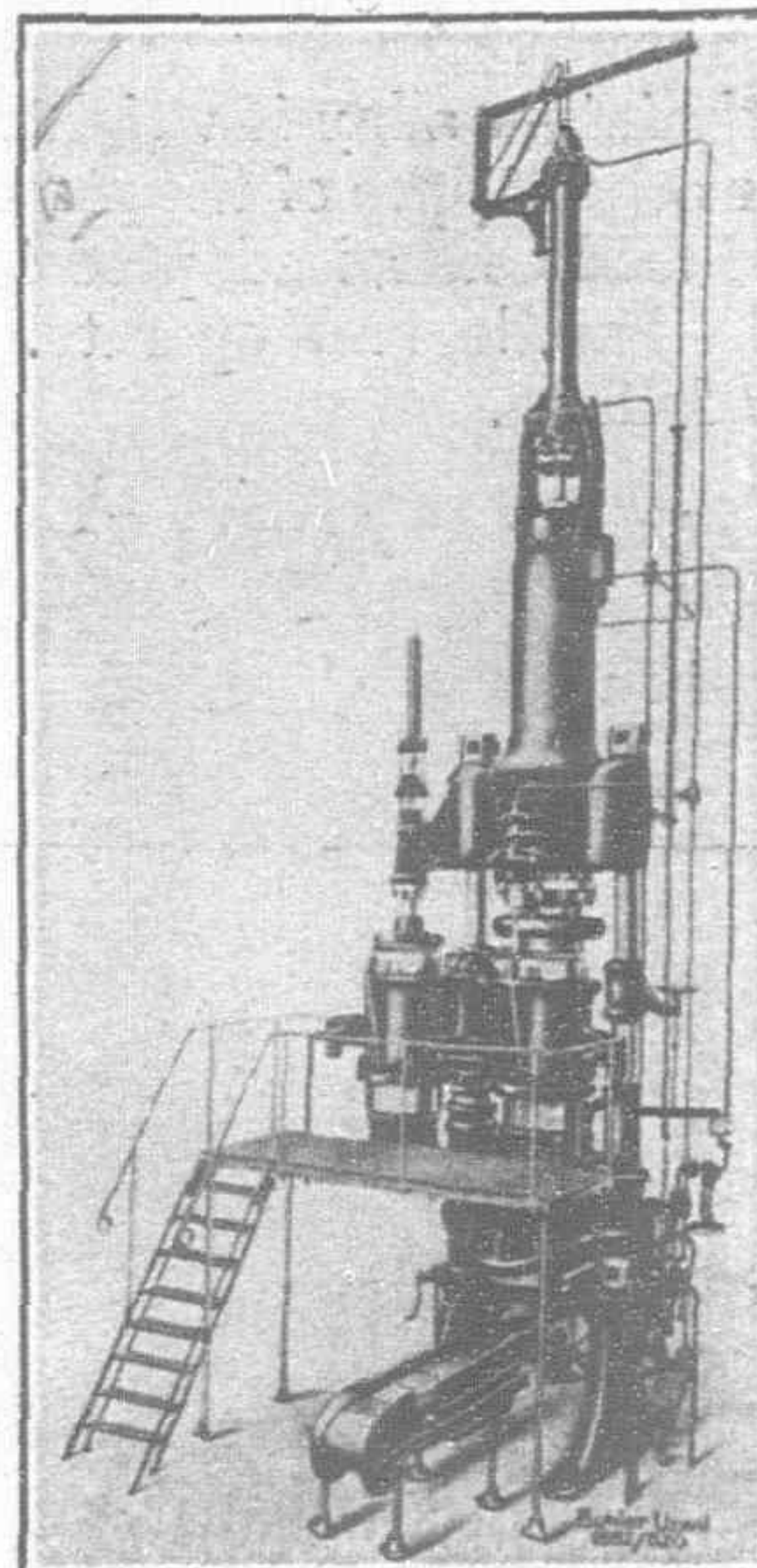
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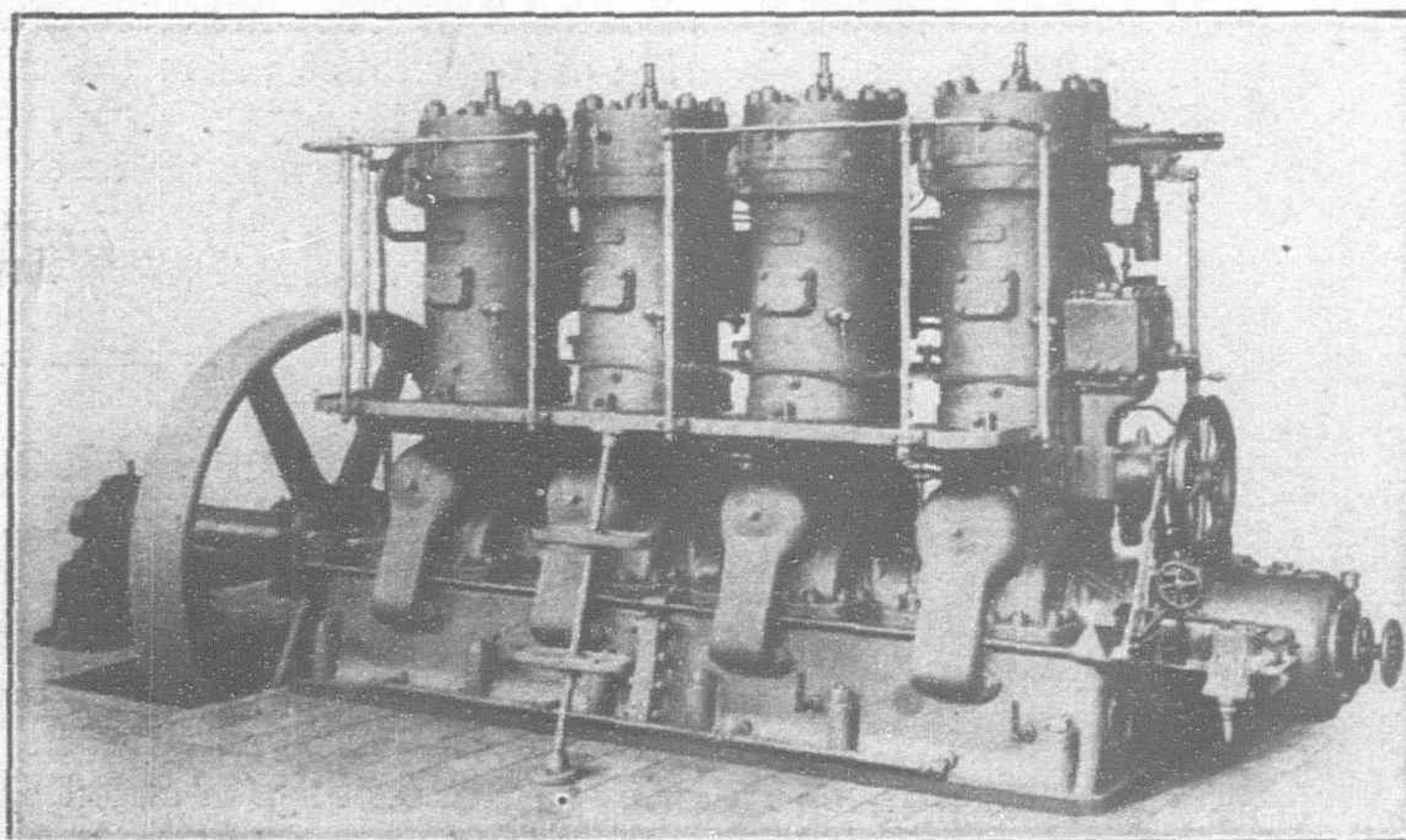
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